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GREEN ON BRONCHITIS.

A Treatise on Diseases of the Air-Passages; comprising an Inquiry into the History, Causes, and Treatment of those Affections of the Throat, called Bronchitis, Chronic Laryngitis, Clergyman's Sore Throat, etc. etc., by Horace Green, A.M. M.D., formerly President, and Professor of the Theory and Practice of Medicine in the Castleton Medical College; late Vice President of the New York Medical and Surgical Society, and Honorary Member of the Philadelphia Medical Society, etc., etc.

Second Edition, with important Additions (shortly).

NOTICES OF THE FIRST EDITION BY THE PRESS.

From the British and Foreign Medical Review.

Having thus given an ample analysis of Dr. Green's work, it remains with us to propound briefly a critical estimate of its value. We think that the author has not only made a most valuable addition to practical or empirical medicine, but that the results of his method of treatment will lead to important changes in the prophylaxis and cure of pulmonary phthisis.

It would appear from various testifying documents which the author has collected together in an Appendix, that his statement as to the practicability and safety of topical medication in laryngeal disease was met by some of his countrymen by a sneering incredulity. There can be no doubt, however, that this part of the question is set entirely at rest; nor does the previous publication of the methods used by Bell, Vance, and Trousseau and Belloc, detract at all from the merit due to Dr. Green, for his persevering and successful attempts to render the treatment of some forms of pulmonary disease more effectual and certain.

We have adopted this mode of treatment recommended by him, and can corroborate his statements as to its great value. Cases of pulmonary affection have in our hands been brought to a satisfactory termination, which we are quite sure, under the treatment ordinarily adopted, would have terminated fatally; and we remember individuals whose cases terminated fatally, who (we feel equally certain) need not have died, at least of that disease which cut them off. This much is due to Dr. Green.

From the Dublin Quarterly Journal of Medical Science.

MM. Trousseau and Belloc employed a solution of the strength of two drachms to the ounce, or sometimes to the half ounce, of distilled water. Their method of applying it was either by means of a small silver syringe with a long curved tube, which could be introduced beyond the epiglottis; or by saturating a bit of sponge attached to a rod of whalebone, which being pressed firmly against the back of the pharynx, discharges some of the solution into the glottis, principally by the involuntary effort of deglutition which it excites. This latter method we have ourselves frequently used with much success. But Dr. Green has found another method of applying the solution to the laryngeal mucous membrane, so simple and so efficacious, that, as we before remarked, he has been induced to publish this volume upon its merits. * * * * *

We shall only say, that we are fully convinced of the originality of observation displayed by our author, and of the perfect truth of the statements contained in his Treatise.

From the New York Journal of Medicine.

The work is got up in the best style of art; clear type, white paper, and beautifully executed colored plates, representing different forms of follicular disease and uvular enlargement, render it attractive to the eye, while its contents commend it to the notice of the practical physician. We hope it will receive, as it richly deserves, the patronage of the entire profession.

From the New York Evening Post.

This treatise is an instance of the superior results obtainable through independent research; and we are gratified that it is written with so much care and excellent arrangement, as to be quite intelligible to the unprofessional reader. The anatomy and physiology of the throat, larynx, and bronchi, are first given with accuracy and fullness; the causes of disease in these parts are then elaborately discussed; and, finally, the treatment explained in a lucid and philosophical manner. The whole subject is also felicitously illustrated by a statement of a variety of cases, each of which serves as the type of a series, and by which the reader may easily judge of the analogy of his own or his friend's case. Several admirably executed colored plates, exhibiting the parts in the different stages of disease, tend to render the subject yet more intelligible; while an appendix contains selections from Dr. Green's correspondence with some of the most distinguished members of the

profession in this and other cities, attesting their confidence in his mode of treatment from their own observation and experience.

The inductive method has been closely followed in this treatise. Its reasoning rests on incontrovertible facts, and to these Dr. Green refers the inquirer. Altogether, the work forms one of the most interesting and important contributions recently made to medical literature, and we sincerely hope its success will be commensurate with its merits.

From the New York Evening Mirror.

The book is ably and carefully written, and will place the author in the first rank of medical writers. Colored engravings, showing the different stages and appearances of diseases of the throat, accompany the work, rendering it not only more valuable, but more clear and comprehensible. It is so rare, in this advanced stage of the science, to come upon a new theory clearly demonstrable by actual experiment, that we hail this book with pleasure. It is still more welcome as furnishing to other physicians the means of curing one of the most common and troublesome diseases of the present generation. It is without doubt *the* remedy over all others.

From the Philadelphia Presbyterian.

This is a remarkably handsome volume, and the colored illustrative plates are finely executed. The chief value of the book, however, is the lucid and scientific mode in which the author treats his subject. Having devoted many years to the study of diseases of the throat, and being particularly successful in their treatment, he now presents to the medical profession the results of his inquiries and experience. We regard the work as a valuable contribution to medical science, and we hope it will receive attention from professional men.

From the Newark Daily Advertiser.

No work in medical science has in many years attracted so much comment and attention as this. The author, Dr. Green, a regular and respectable physician in New York, is entitled to the credit of having successfully introduced in this country the practice of applying topical remedies in chronic diseases of the Larynx, and the handsome work before us is the result of his experience and practice, published for the benefit of the world.

We have read the work with deep interest, and commend it to the attention of readers who take an interest in the subject.

From the Cincinnati Chronicle.

This work comprises an inquiry into the history, pathology, causes, and treatment of the several diseases of the throat, above named, which have become so prevalent of late. It is written in a clear and forcible style, and the opinions of the author are illustrated, if not fortified, by ample opportunities of observation. Although we feel incompetent to pronounce on the soundness of the principles it advocates, we do not hesitate to recommend it as well

worthy the serious attention of the Medical profession, and of all, indeed, who feel an interest in the treatment of the important and troublesome disease to which it relates.

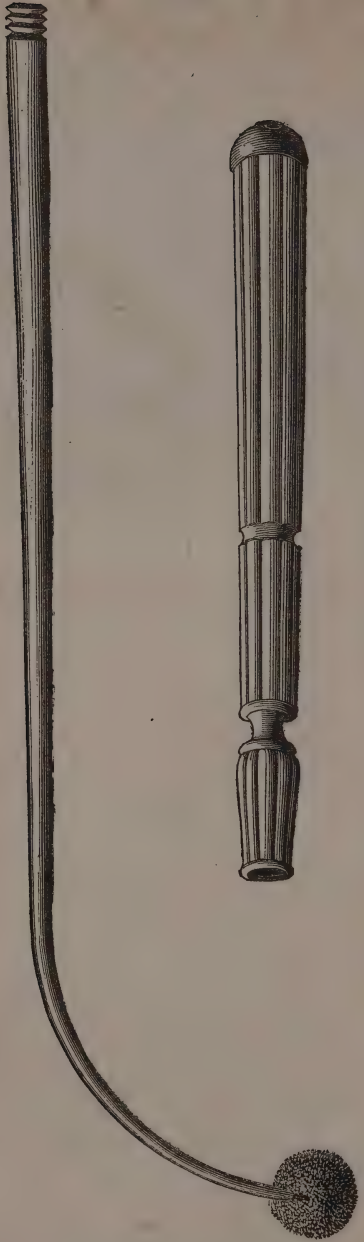
From the New York Observer.

The work is ably written, and shows a man thoroughly master of his profession. He writes with great clearness and force, and the book will place him high on the list of medical writers, and reflect honor on him both in this country and in England.

From the New York Commercial Advertiser.

The volume in which it is proclaimed and described, will probably make what is called a sensation in medical circles both in England and the United States, and practitioners, we may fairly presume, will be prompt in possessing themselves of its contents.

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For description of Plate see page 83.

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OBSERVATIONS

ON THE

PATHOLOGY OF CROUP:

WITH

REMARKS ON ITS TREATMENT

BY

TOPICAL MEDICATIONS.

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BY

HORACE GREEN, A.M., M.D.,
ETC., ETC.

NEW YORK:
JOHN WILEY, 161 BROADWAY,
AND 13 PATERNOSTER ROW, LONDON.

1849.

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PREFACE

When, about eighteen months ago, the author brought before the medical public, in a work on Diseases of the Air-Passages, the subject of the treatment of disease of the larynx and trachea, in the adult, by means of the direct application of therapeutical agents to the lining membrane of those cavities, the proposition was received with distrust by a large proportion of the profession; whilst another part publicly and peremptorily declared that it is practically impossible to convey medicinal agents, in the manner proposed, below the epiglottis.

Less than two years have passed, and that practice which, as the British and Foreign Medical Review has remarked, was received by "some of the author's countrymen with a sneering incredulity," and was by them declared to be an "unwarrantable innovation," an "anatomical impossibility," as well as "physiologically impracticable," has been adopted, not only by distinguished medical men in almost every part of this country, but by the highest medical authority of Europe; and by the latter has been commended as a method of treatment which is not only the most effectual and certain in some forms of pulmonary disease, but as one that "will lead to important changes in the prophylaxis and cure of pulmonary phthisis." Less reluctantly, therefore, does the author now advocate—as he has done in the following pages—the practice of making topical application of medicinal agents

into the larynges of young children, for the treatment of membranous croup. Nor does he hesitate to declare, although the proposition may be received by many with allowance, that it is a plan entirely practicable, safe, and, when judiciously employed, in the highest degree efficacious.

The first successful attempt to introduce a solution of the nitrate of silver into the larynx of a child affected with croup, was made by the author, in November, 1842. During a period of nearly four years, previous to this time, he had been constantly employing this remedy, locally, in chronic laryngeal and bronchial diseases of adults. But, up to the above period, such were the prejudices against its employment, and such the scepticism of a large proportion of the profession on the subject of topical applications to the larynx, in the cases of adults even, that, hitherto, he had not ventured on its use in the treatment of diseases in young children; although the happy effects which in so many instances had followed the application of a strong solution of the nitrate to the diseased pharyngo-tracheal membrane and its follicles, had long before convinced him that the same remedy must prove highly efficacious in a disease so strictly local, and of a nature so peculiar, as is that of Croup.

The history of one of the earliest cases of Croup which came under his observation, and was treated by topical applications to the larynx, was given at a meeting of the New York Medical and Surgical Society, November 1st, 1845, and the members present were desired to make trial of the local remedy, whenever an opportunity for employing it in Croup might occur. Several cases were, subsequently, thus treated, and with success, by other medical men in this city; a notice of some of these will be found in the subsequent pages.

In describing, in this work, the application of the nitrate of silver to the mucous membrane, the term *cauterization* is frequently employed. It is not strictly correct ; for, a solution of the crystals of nitrate of silver, of the strength of from two to four scruples of the salt to an ounce of distilled water, when applied freely to the mucous membrane, does not act, as has been supposed, by burning, or as a cautery; it effects no destruction whatever of the textural matter, but forms, immediately, an union with the albumen, and other secretions of the mucous lining ; whilst it operates at the same time to produce a most favorable change in the vital action of the parts.

In conclusion, this little work, and the practice herein advocated, are commended to the candor of that portion of the profession who have the liberality to admit that improvements in the practice of our art can be made ; and the energy and honesty to test such proposed improvements before condemning them.

12 Clinton Place.
New York, Sept. 1848.

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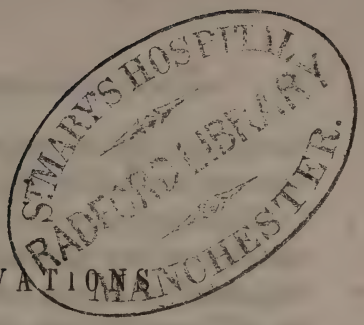
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ERRATA.

Page 12, Sixth line from the bottom, omit comma after *greatest*.
" 16, Ninth " " " top, for *municipereous*, read *mucipereous*.



OBSERVATIONS

ON THE

PATHOLOGY OF CROUP.

CHAPTER I.

NATURE AND PATHOLOGY OF CROUP.

The distressing nature of *Croup*—its frequent fatality, and the interesting class of patients who, ordinarily, are the subjects of its attack,—invest with a peculiar interest any plan of treatment which promises to mitigate its horrors, or in any degree to lessen its fatality.

Notwithstanding that the energies of some of the most distinguished medical men of the present century have been given to an investigation of the nature and the treatment of this disease, yet it is admitted at the present day by the best authorities, to be not only progressively on the increase, but so far uncontrolled by the ordinary remedial measures, as to prove fatal in

nearly one half of the whole number of those who are attacked by the disease![1]

With emphasis, then, may it be said, that no member of our profession has discharged his duty, until he has at least made earnest efforts to add something to our stock of knowledge, respecting the pathology or the treatment of this formidable malady.

Not until after the middle of the last century, was Croup recognised and described as a distinct disease. Until that period it was confounded with catarrh, and other diseases of the respiratory apparatus; but in 1765, Dr. Home of Edinburgh drew up and published an Inquiry into its nature and treatment, and gave to the disease the name of *Croup*;—an appellation by which it is universally designated at the present day.

The celebrated general order issued by Napoleon, in 1807, from the head quarters of Finkenstin,—"d'ouvrir un concours sur la maladie connue sous le nom de croup," with the offered prize, awoke a new interest on this subject in Europe, and was the means of calling forth, from the savans of the continent, many

[1] Traité du Croup, par M. Double, p. 479.

elaborate and able essays on the disease, in which, says Dr. Cheyne, nothing was omitted in illustration of that disorder which industry could collect, or method arrange. These learned inquiries of the aspirants for the prize at concours, have been followed, during the last forty years, by numerous and valued essays on the pathology and treatment of croup, contributed by some of the most distinguished medical men of both Europe and America: and yet the views respecting its essential nature, and the opinions regarding the most certain and efficacious mode of its treatment, are not uniform, or well settled with the profession.

Diverse, moreover, are the opinions of the different writers on croup, with regard to the unity or the division of the disease into distinct varieties; some, on the one hand, making several species of the affection, according to the views entertained of its nature; others, again, considering the disease to be essentially one and the same in all cases, and as being modified only by external circumstances, or by difference of constitution in the subjects attacked.

These varied opinions of different pathologists on this and other affections, serve to embarrass the inexperienced, and to hinder our progress in the knowledge of disease.

Without attempting to settle any of the questions involved in these different opinions, I shall proceed to state that, after having given much attention to the study and treatment of the disease whilst actually engaged in a general practice through a period of more than twenty years, I have come to the following conclusions:—

1. That true croup, pathologically considered, is a special or single disease; being dependent for its existence, like tubercular phthisis, on a peculiar or specific cause.

2. That its distinctive and essential characteristics consist in an inflammation of the secreting surfaces of the fauces, larynx, and trachea, which is always productive of a membranaceous or an albuminous exudation.

3. That the membranaceous concretion, which is found coating the inflamed mucous surface of the parts in croup, is an exudation,—not from the membrane itself, but is secreted by the muciperous glands, which so abundantly stud the larynx and trachea.

4. That the exudative inflammation commences invariably in the superior portion of the respiratory passages, and extends from above downwards—never in the opposite direction.

1. The opinion that croup, in its access, is

essentially one and the same disease—being only modified by epidemic influences, by difference in constitution, or by other fortuitous circumstances, is founded principally on the pathological fact, that the inflammation peculiar to this disease is always attended with an exudation of plastic lymph.

Not that I would here maintain with MM. Guersent and Bretonneau, that the perfect formation of a *false membrane* is necessary to constitute the distinctive character of croup, and that the cases where this is not formed are, as they declare them to be, instances merely of *false* croup; but this I affirm, that inflammation of the respiratory mucous membrane,—whatever may be its grade,—if unattended with an albuminous exudation—can no more constitute croup, than any of the various diseases of the lungs, or of their tissues, which are unaccompanied with a tuberculous deposition, can constitute true pulmonary phthisis.

I agree fully with Prof. Hasse,[1] that the exudation of croup may present various gradations, or different degrees of density. In some instances it consists of a tenacious mucus, wherein

[1] An Anatomical Description of the Diseases of the Organs of Circulation and Respiration. By Charles Ewald Hasse, M.D., &c. Sydenham Society Edition, p. 278.

are suspended thin, membranaceous flocculi,—or, in other words, the viscid mucus is blended with fibrine in various proportions; sometimes, again, of a layer, resembling both in color and consistency that which settles upon scalded cream; and sometimes of a firm and tough false membrane of considerable thickness, and which extends not unfrequently from the fauces, throughout the greater portion of the air-passages. Not that this concrete albuminous membrane will be found to be present in all cases of croup, but it is here maintained, that the effusion of coagulable lymph is the essential pathological character of the disease; and that the degree of density of the plastic exudation will depend upon the intensity of the inflammation, and the duration of the disease. When a child dies very early in the malady, says Dr. Copland,[1] instead of the formation of a concrete false membrane, the parts will be found coated only with a tenacious mucus, or fibrinous exudation. As the disease advances, this glutinous secretion becomes more condensed, and moulded into a false membrane, or it may be found having assumed a but partially concrete condition. "La présence de cette fausse membrane est le caractère

[1] Dictionary of Practical Medicine. Article, Croup.

anatomique fondamental de cette affection. Sans ce produit nouveau, il n'y a pas de croup. * * * *

"Les fausses membranes sont exclusivement formées de fibrine."[1]

That form of the affection which has been termed Spasmodic Croup by some writers, is a variety of this malady, and not a distinct disease.

When children of a nervous temperament, or of weak and irritable habits, are exposed to the ordinary exciting causes of croup, and become the subjects of the disease, we then have the spasmodic variety of the affection; or, in other words, the inflammation, under such circumstances, is of a sub-acute character; the albuminous secretion is more tardily effused; but there is present, from the commencement of the disease, a great predominance of spasmodic and nervous symptoms. The stricture of the glottis which attends this form of the malady is spasm caused by inflammation, occurring in weak children of the above nervous temperament.

This inflammation, Dr. Cheyne[2] observes, is often spontaneously resolved, the spasm depend-

[1] Manuel Pratique des Maladies des Nouveaux-Nés, et des Enfants à la mamelle. Par M. Bouchut. Article, Croup.

[2] Cyclopædia of Practical Medicine. Article, Croup.

ing upon it subsiding at the same time ; and this has given rise to the opinion that there is a purely spasmodic species of croup,—an opinion not sustained by the pathology of the disease. "With respect to the inflammatory and the spasmodic varieties of croup," says Mr. Ryland, "I have before stated that this division can refer only to the predominance of either set of symptoms. The nature of the disease is essentially inflammatory, but in weakly, leucophlegmatic children,who are always more subject to nervous affections than the more active and healthy race, it sometimes assumes a spasmodic form, inasmuch as the vascular excitement is comparatively trifling, whilst spasm of the glottis and general convulsions occur frequently during the disease, and the remissions are singularly long and complete."[1] The occurrence of short intervals of natural breathing, which take place suddenly, every now and then, in spasmodic croup, has been adduced by some writers as characterizing this form of the disease, and as indicating, they suppose, the non-inflammatory nature of the affection. But these remissions, which take place for the most part in the

[1] A Treatise on the Diseases and Injuries of the Larynx and Trachea. By Frederick Ryland, p. 127.

early stage of the disease, occur, not because there is no degree of inflammation present, and, consequently, no obstructions from albuminous secretions, but for the reason that this last morbid condition is not of sufficient extent, at this period of the malady, to embarrass respiration, whenever perfect relaxation from the spasm takes place. As the disease advances, and the membranaceous exudation increases, and becomes denser, the remissions are less complete, and of shorter duration,—the exacerbations more prolonged, and the cough and difficulty of respiration more severe.

M. Guersent, and other pathologists, have shown from the dissection of cases, where this spasmodic form of croup has terminated fatally, that "albuminous concretions—sometimes extensive, but more frequently consisting of small isolated patches, are found in the larynx ;"[1] and Dr. Williams, in a Treatise on Diseases of the Respiratory Organs, also affirms that "although the albuminous effusion is generally thickest and most tough in sthenic cases of croup, yet it is pretty abundant in asthenic cases ; so much so, that Andral and Gendrin consider plastic inflammation of the mucous membranes to be

[1] Dictionary of Practical Medicine. Article, Croup.

rather of the sub-acute, than of the most acute kind."[1]

Dr. John Ware of Boston, who, in his admirable "Contributions to the History and Diagnosis of Croup," has done more to elucidate the true pathology of membranous croup, than any other writer in this country, makes two distinct varieties of the affection, in the pathology of which he thinks there is an original and essential difference.

These two forms of croup, Dr. Ware has distinguished as membranous and inflammatory croup,—the former being characterized by the presence of a false membrane in the air passages, while the latter differs from the first variety only in the supposed absence of this adventitious membrane.

According to Dr. Ware, the severe form of the disease occurs much less frequently than the milder variety, is but little affected by any form of treatment, and is almost always fatal. Of one hundred and thirty-one cases of croup, observed by Dr. Ware, in the course of twenty-five years, twenty-two only of these were cases of true or membranous croup ; of which number nineteen died.

[1] Ut supra, p. 140.

The principal grounds, with Dr. Ware, for believing that the two forms of croup are pathologically different from each other, are thus stated ;—"The very great preponderance of fatal results, in the membranous croup, and a similar preponderance of recoveries in the inflammatory ; and the evidence which exists that in the few cases of recovery from the former, the membrane has been formed, and in the few cases on record of death from the latter, that a membrane has not been formed—afford strong reason for believing that the diseases are essentially different."[1] And yet Dr. Ware, with much candor, observes on another page, "that with our present amount of knowledge, he would not be understood even to assert positively, that they are not different manifestations of the same disease."[2]

In the above form of the disease—which has been considered as a single affection, it is not intended to include that hysterical affection of adult age, described by Dr. Cheyne, which not unfrequently assumes the character of croup ; nor that disease of infancy, termed *laryngissimus stridulus*, which, the above writer observes,

[1] Contributions to the History and Diagnosis of Croup. By John Ware, M.D., p. 12.

[2] Loco citat. p. 3.

ought never to be called croup, inasmuch as it is not attended with cough, and leaves, on dissection, no trace whatever of inflammation of the larynx.

The membranaceous exudation consequent upon violent inflammation of the air-passages during *measles* and *scarlatina*, and which sometimes appears about the fauces, and in the upper portion of the larynx, differs, according to modern pathology, from that which takes place in croup. The fluids having become vitiated in these diseases, there is secreted a much less amount of fibrine than takes place in primary croup ; hence the false membrane is less consistent,—less uniformly spread over the involved part, is friable, and prone to decomposition.

Although it is maintained that croup is essentially a single disease, being only modified by difference in constitution, epidemic influences, and other circumstances ; yet it may with propriety be divided into *laryngeal*, *tracheal*, and *bronchial* croup, according to the seat of the greatest, intensity of the inflammatory action ; and inasmuch as " the treatment and the prognosis may be in some measure influenced by the locality of the disease," croup, moreover, may be complicated with, or be consecutive to, other affections of the air-passages. It

may be associated with chronic bronchitis, and there is then presented that form of the disease which Dr. Rush denominated, *Cynanche Trachealis Humida.* In many cases, symptoms of acute bronchitis are predominant, but ordinarily in this form of the affection, the bronchial disease is consequent upon the exudative inflammation. In a large proportion of the cases of croup which terminate fatally, the inflammation will be found to have extended into the bronchi, filling, indeed, the terminal branches, and even the interstitial cells, with an effusion of serum, and it is this bronchial effusion which in some instances is the final cause of the fatal result.

2. The truth of the second proposition stated; namely, that the essential pathological character of croup is inflammation of the lining membrane of the larynx and trachea, attended by a concrete albuminous exudation, is unanimously admitted by the best pathologists of the day.

The plastic exudation which is poured out upon the surface of the mucous membrane in croup, forms with great rapidity. It consists mainly of fibrine blended with mucus in various proportions; and it presents different degrees of density, and varies much in thickness, and extent of surface over which it is spread. In some cases, it consists of a tenacious mucus

blended with a small proportion of fibrine; sometimes of a dense, albuminous concretion; and, again, it is found in the form of a thick adventitious membrane, extending from the epiglottis without breach of continuity to the extremities of the bronchial ramifications.[1]

3. With respect to the source of that peculiar exudation which is poured out upon the inflamed mucous surfaces in croup, I have before expressed the opinion that it is an effusion from the diseased follicles of the tonsils, larynx, and trachea.

Anatomy has revealed to us that the tonsillary glands are composed, almost entirely, of an aggregated mass of follicles, enveloped in folds of the mucous membrane; that the lining membrane of the larynx is studded with mucous follicles, especially that portion of it which occupies the upper part of this organ. These glands, indeed, are very numerous in the thickness of the superior vocal cords, within the ventricles of the larynx, and in the folds of the mucous membrane, in front of the arytenoid cartilages. The lining membrane of the trachea is supplied still more abundantly than that of the larynx with the mucous cryptæ.

[1] A Treatise on the Diseases and Injuries of the Larynx, &c. By F. Ryland, p. 134.

Now, it will be found, that wherever these glands are the most numerous in the air passages, there, ceteris paribus, will the albuminous exudation be the most abundantly poured out in the inflammation of croup, and the adventitious membrane will be the densest and the most perfectly formed.

The fluid secreted by the mucous follicles of the air-tubes, being intended to lubricate these passages, is, in the normal condition of the glands, bland and transparent, not abundant in quantity, and possesses no qualities of an acrid or adherent nature.

It consists, according to late microscopic observations, of water combined with a viscid substance, which is termed mucus, and which constitutes about five per cent. of the whole amount.

When the mucous membrane of the larynx and trachea becomes the seat of the exudatory inflammation of croup, the glands which in health lubricate its surface, are now found, from some peculiarity of irritation, to elaborate a vitiated fluid, or a fibrinous exudation, which, sooner or later, if the disease continues, is changed into an adherent false membrane, having generally its greatest degree of thickness in the larynx and trachea, but becoming thinner as it descends towards the bifurcation.

The opinion here adduced, that the plastic exudation in croup is poured out by the mucous glandulæ of the parts where the disease is located, finds confirmation in the interesting fact recorded by Prof. Hasse; namely, that "filamentous bands are sometimes found between the plastic exudation and the mucous membrane, consisting merely of delicate fibrous threads *which dip into the orifices of the municiperous glands.*"[1]

4. I have, on a former occasion,[2] expressed the opinion that the physiological and pathological relations which exist between the throat and the respiratory tubes, are not justly regarded by medical writers, in describing the nature of those diseases which affect these different parts.

Affections of the throat are ordinarily arranged by nosologists in connexion with those of the œsophagus: or are treated independently of those diseases which occur in the larynx, trachea, and bronchi.

Pathologically considered, the relation which exists between the fauces, tonsils, and pharynx, on the one hand, and the respiratory tubes on the other, is much more intimate and important

[1] Op. citat. p. 280.

[2] See, A Treatise on Diseases of the Air Passages, &c. p. 24.

than the connexion which exists between the throat and the œsophagus.

In almost all the inflammatory affections of the air-passages, whether primary or consecutive, the diseased action has its origin in the fauces and pharynx, and extends, by continuity, from thence to the respiratory tubes. This is especially true with regard to the origin and progress of the exudatory inflammation of croup. Here, the morbid action commences primarily about the fauces and the upper portion of the respiratory passage, and extends, universally, from above downwards. Dr. Porter, I am aware, observes in his work on the "Surgical Pathology of the Larynx and Trachea,"[1] the effusion of coagulated lymph is very generally confined to the larynx alone; but still, in a number of cases, the inflammation commences in the bronchial cells, and proceeds upwards in the windpipe. But this view of the course of exudative inflammation is not sustained by the observations of modern pathologists. Professor Rokitansky, who is undoubtedly one of the first pathologists of the age, says, that the exudative process progresses from the epiglottis downwards, extending in some instances to the very minutest branches

[1] Ut supra, p. 36.

of the bronchi; and that bronchial croup is a disease of youth and early manhood, and when occurring in the terminal branches of the bronchi, is always simultaneous with pneumonia,[1] and consequently in such cases cannot be *true* croup. Prof. Hasse also, whose late work on Pathological Anatomy has been translated and published by the London Sydenham Society, observes with regard to the exudatory inflammation of croup, that its progress is invariably from above downwards, and that it never spreads in the opposite direction. This law is so universal, that where plastic inflammation occurs in the bronchi of the adult, as the concomitant of pneumonia, it can only descend to the pulmonary cells, never mount to the larynx.[2]

Let this important point, advanced in this last proposition, with reference to the pathology of the disease, be fully established, and universally understood by the profession, and it will be at once perceived what important results may follow the topical employment of appropriate remedial agents, in the early treatment of true inflammatory croup.

[1] Treatise on Pathological Anatomy, translated by Dr. J. C. Peters, pp. 22 23.

[2] An Anatomical Description of the Diseases of the Organs of Circulation and Respiration. By Charles Ewald Hasse, M. D. &c., Sydenham Soc. Edition, p. 276.

In the preceding brief observations, on some manifestations in the especial pathology of croup, reference has not been had to other important points in its general pathology, to which it may be well briefly to allude.

From an examination of the tables given by M. Caillon, Ryland, and other foreign authors, it appears that croup is a disease of childhood, and attacks children most frequently between the second and tenth years. In this country, the age at which children are most liable to this disease, is probably from one year to eight years old.

There are few cases on record where it has occurred as early as the sixth month. In the table given by Ryland,[1] embracing the experience of some fourteen authors, it had been observed only once at the age of seven months, and never at an antecedent period.

With the morbid changes which are revealed by an examination of the bodies of children who have died of croup, medical men are now generally familiar. Ordinarily, the lining membrane of the air-passages, particularly that of the larynx and trachea, is found inflamed, its tissues tumid, and the entire surface of these parts is coated, either with an adventitious membrane,

[1] Loc. citat. p. 130.

or a less densely formed albuminous exudation, varying in consistence according to the duration of the disease, and the intensity of inflammation which had been present. This exudation is composed almost entirely of fibrine blended with mucus, in various proportions.

In the first stage of the disease the plastic exudation consists of a tenacious mucus, wherein are suspended shreds of coagulable lymph. In the second stage, the mucous surface of the larynx and trachea becomes partially or wholly coated with a membranaceous exudation of considerable density, and which is finally moulded, in the last stage, into a firm, false membrane,—extending sometimes throughout a greater portion of the air-passages, and pervading even the minute ramifications of the bronchial tubes. This membranaceous product, when first formed, adheres with considerable firmness to the mucous membrane; but after an interval, and as the inflammation abates, a watery mucus, or a muco-purulent excretion, becomes deposited beneath the plastic layer, which serves to loosen and to assist in detaching the adventitious membrane, when it is sometimes expelled by violent coughing, either in fragments or in a cylindrical mass, which represents the parts upon which it had been moulded.

It is a mistake to suppose, as many do, that the secretion of the characteristic discharge of croup begins in the early stages of those catarrhal symptoms, which precede, frequently, for many hours, the development of true inflammatory croup. In the most violent and acute forms of the disease, the plastic exudation commences nearly simultaneously with the inflammation, to be poured out upon the inflamed mucous surface; but in some instances a pre-existing catarrhal stage, of several days' duration, may be present, before the occurrence of that peculiar inflammation which disposes the vessels of the membrane to exude the albuminous deposit. "No sooner, however," says Prof. Hasse, "does the catarrhal irritation merge into inflammation, than the plastic lymph is thrown out, and the parts immediately suffer that disturbance of nervous energy, which results from all violent inflammations."[1] Instances, too, may arise where the early occurrence of violent spasms shall destroy the patient, while as yet the exudation has assumed no degree of density, and it will then be found in the air-passages, presenting the appearance of a layer of viscid, whitish mucus; or, at most, there may be perceived irregular

[1] Op. citat. p. 277.

fragments of adherent lymph in the glottis and larynx, but more particularly about the tonsils. "This glutinous exudation," Dr. Copland remarks, "becomes more and more condensed and moulded into a false membrane, or partially assumes this state, as the disease advances."[1]

The membranaceous exudation differs much, not only in its density, but in its depth, and the extent of surface over which it is spread. It is commonly thickest in the upper and posterior part of the trachea. Dr. Ryland[2] observes that it ranges from half a line to a line and a half. Dr. Copland[3] considers a line and a half or two lines to be its utmost thickness, and Professor Hasse[4] remarks that its depth is extremely variable, but nowhere exceeds three lines.

Croup usually subsides after the occurrence of a single process of exudation; but cases are recorded where the inflammation has continued until the formation of a second, and even a third adventitious membrane. It is not therefore improbable, in the examples given by authors, where the albuminous deposit equalled two or three lines in thickness, that several successive layers had been poured out, during the severity and continuance of the inflammation.

[1] Dictionary of Prac. Med. p. 531.
[2] Op. citat. p. 135.
[3] Dictionary of Prac. Med. p. 531.
[4] Ut supra, p. 278.

Examples of the great extent of the false membrane are given by different writers. Bretonneau[1] gives several instances of its extending in a connected and uniform layer, from the epiglottis to the rami of the bronchial tubes. Bricheteau,[2] Dr. Ryland,[3] and Prof. Horner,[4] of our own country, give instances of a similar extensive pervasion of the plastic exudation.

The post-mortem appearance of the mucous membrane, subjacent to the membranaceous deposit, varies according to the intensity and duration of the disease. In the acute form of the affection, and particularly where death takes place early, the lining membrane of the larynx and trachea is inflamed, and sometimes even of a vermillion hue, throughout the greatest part of its extent. In other instances, and at a later period, it is found paler, and presenting in color a rosy tint only. Still later, as in the last stages of the disease, the redness of inflammation will have disappeared, and the mucous membrane will present its natural pale color. On this point, Dr. Ryland[1] has very properly observed: "It is not always possible to determine, from the results of an examination of the dead body, what was the state of parts before the final

[1] Traité de la Diphtherite.
[2] Précis du Croup, p. 274.
[3] Ryland p. 134.
[4] Pathological Anatomy, p. 310.
[1] Op. citat. pp. 135–36.

change took place, and this is especially the case with regard to inflamed membranes; in puerperal peritonitis, for example, which is unquestionably an inflammatory disease, and one the symptoms of which cannot readily be mistaken, how often do we find the peritoneum free from redness? The same observation holds good with regard to inflammation of the skin, the redness which exists antecedent to death vanishing most completely on the occurrence of that event. * * * *

"It happens but very rarely that we have an opportunity of examining the state of the membrane in the first period of croup, before the formation of the albuminous concretion; and it is on this account, in a great measure, that we seldom find any vivid injection of the parts, for the secretion of the lymph weakens the inflammation most commonly, and in the end puts a stop to it entirely."

It has before been stated that croup is a disease of childhood, that it is essentially inflammatory in its nature, affecting especially the secretory surfaces of the larynx and trachea. But the question here occurs, and it is one which many able pathologists have endeavored to elucidate,—why does the inflammation of croup differ from the laryngeal and bronchial

inflammations incident to childhood, and which affect the same parts with this disease? Since the experiments, instituted by Jurine, Schmidt, and other essayists at the concours of Napoleon, to produce artificial croup in the lower animals (they having succeeded in producing a false membrane in the air-passages of young animals only), many pathologists have adopted the opinion that the peculiarity of the product in the inflammation of croup, is attributable to an excess of albumen in the blood of young children.

Dr. Copland, who strongly advocates this theory, affirms that he has "uniformly observed the fact; namely, that the quantity of fibrine and crassamentum in the blood taken from the patient, and of albumen in the urine, have been great in proportion to the inflammatory type of the disease, and the disposition to form a false membrane." On the other hand, Ryland, Williams, and other writers on the disease, attribute the peculiarity of the product of croup to the circumstance of the inflammation being more deeply seated than that of bronchitis; namely, in the cellular tissue that enters into the composition of the mucous membrane—from the secernent arteries of which the albuminous exudation is secreted. Although in most cases of croup the sub-mucous cellular tissue is infiltrated with

serum, the effect of inflammation, yet according to Rokitansky,[1] it is not so, in all fatal cases of the disease. It is therefore an unsettled question in the pathology of croup, whether the albuminous product is owing to some peculiarity in the nature of the inflammation, or in the structure which is the subject of it.

[1] Op. citat. p. 22.

CHAPTER II.

LARYNGEAL AND TRACHEAL CROUP.

In the preceding pages, I have taken a brief view of the opinions entertained by some of the best authorities, with regard to the nature and pathology of croup.

I have also alluded to my own views as to the unity of the disease, and the nature and origin of the product which constitutes its distinctive characteristic; and I have endeavored to show, that the commencement of that exudative inflammation of the respiratory passages that occurs in true croup, is invariably in the upper portion of these tubes, and that the morbid action extends only from above downwards.

Guided by this view of the seat, progress, and pathology of croup, and an extensive experience in the topical treatment of other diseases of the air passages, I adopted the determination several years ago to make the attempt in croup, whenever opportunity should offer, to arrest the exudatory inflammation, and thus prevent the

formation of a false membrane; or, when formed, to promote its separation and consequent expulsion by the employment of topical applications to the mucous surfaces of the fauces, larynx, and trachea.

A part of the results of these efforts will be found in the history of the following cases.

In the treatment of croup with topical remedial measures, I have always employed a solution of the nitrate of silver, as, in my opinion, there is no known therapeutic agent, which for safety, efficiency, and certainty of action, can compare with the crystals of the nitrate of silver, in the local treatment of laryngeal, tracheal, and bronchial affections.

In preparing the solution, the pure crystals should be employed, and not the fused or solid nitrate, as the latter is much more likely than are the crystals, to contain the nitrate of potash, or copper, or lead in combination. A solution of the crystals, of the strength of from two to four scruples of the salt to an ounce of distilled water, when applied freely to the mucous membrane, does not act, as has been supposed, by burning, or by a destruction of the textural matter. It forms, immediately, an union with the albumen, and other secretions of the mucous lining; whilst it operates, at the same time, to

produce a most favorable change in the vital action of the parts.

The first favorable opportunity which presented itself for the employment of nitrate of silver, as a topical remedy, in croup, came under my notice in November, 1842.

CASE I.

On the evening of the 20th of November, 1842, I was called to see John S——, aged three years, the son of a widow woman in this city. He was in the last stage of croup, having been attacked with the disease about a week previous to the time of my being called. Catarrhal symptoms had preceded, for several days, the full development of the croupal stage.

The ordinary remedies had been employed, but without arresting in any degree the progress of the disease. The great prostration, the stridulous respiration, and other symptoms of threatened suffocation, which were present, indicated the stage of collapse, and that no relief could be expected from the employment of common means. Under these circumstances, I proposed the cauterization of the larynx, with the hope that some relief might be obtained from this operation.

The proposition being acceded to by the friends of the little sufferer, I proceeded at once to apply a solution of the nitrate of silver, of the strength of twenty grains to the ounce of water, freely to the fauces, and into the cavity of the glottis. The application was followed by a violent expulsive cough ; by which a large quantity of ropy mucus was discharged. Considerable relief followed this operation ; the respiration became much less embarrassed, and so continued during a greater part of the following night. Towards morning, however, the croupal symptoms recurred with much violence, and when I saw my patient at an early hour the next day, the prognosis appeared so unfavorable, that I did not deem it advisable to renew the application.

The patient died the same day. No examination of the body was made.

This case is adduced as being the first instance, in my practice, where a successful attempt had been made to introduce the nitrate of silver into the larynx of a child affected with croup. During a period of nearly four years, previous to this time, as may be seen by referring to my work on Diseases of the Air Passages, I had been constantly using this remedy, locally,

in chronic laryngeal and bronchial diseases of adults.

But up to this period, such were the prejudices against its employment, and such the scepticism of a large proportion of the profession on the subject of topical applications to the larynx in cases of adults even, that hitherto I had not ventured upon its use in the treatment of disease in young children. The marked relief which for a time followed its employment in the above case, although adopted as the "ultimum remedium," in the hopeless stage of the disease, and the small amount of irritation caused by the application, encouraged me to repeat the remedy on subsequent occasions.

CASE II.

Oct. 19, 1845.—I received a message to meet two medical gentlemen of this city in consultation, in the case of an interesting little daughter of Mr. H., who was reported to be dying of croup.

On repairing to the house, I found the medical attendants in waiting, from whom I received the following history of the case The little patient, who was three years old, had been suffering, for several days previous to the attack of

croup, from a hoarse cold, which was attended with a dry, barking cough. No alarm, however, was awakened in the minds of the parents until the evening of the 18th, when the child was suddenly and violently seized with croup. The family physician was immediately called, by whom the usual remedies were promptly employed. No relief, however, following these measures, a consulting physician was called the next day, and other active measures were adopted. But the disease progressed with great rapidity until the evening of the 19th, at which time I was called.

On entering the room, I found the child struggling for breath, for respiration seemed to be performed with the greatest difficulty. The head was thrown back; the lips and face were livid; and the whole countenance was expressive of the greatest anxiety. It was proposed that I should attempt to cauterize the larynx; but so near suffocation did the child at this time appear to be, that I declined attempting to perform the operation, unless the attending physician would state to the friends of the patient its present hopeless condition; for I feared that the impending fatal termination, which seemed so likely to follow, might be attributed to the effects of the application. This was done;

and, at the request of the father of the child, and the medical attendants, I proceeded to apply a strong solution of the crystals of nitrate of silver (forty grains to the oz. of water), to the interior of the larynx. To effect this, the head of the child, thrown back, was held firmly by an assistant, the tongue depressed, and a small, round sponge, fastened to a bent probang of whalebone, and dipped in the solution, was passed over the top of the epiglottis, and pressed suddenly downwards and forwards, into the cavity of the larynx. A convulsive cough followed this operation, and a large quantity of dense, adhesive mucus was discharged, in which traces of the false membrane were observed; and, adhering to the sponge, also, were found fragments of the same albuminous concretion. The respiration, soon after this, was in some degree relieved, the countenance was not so livid, and there was less jactitation. After a delay of nearly two hours, during which there was no increase of the distressing symptoms, the application was repeated. The same results followed the second application, that attended the first; and the embarrassed respiration was decidedly more relieved.

The second cauterization was made at eleven o'clock in the evening. One grain of calomel

was ordered every three hours during the night, and I was requested to meet the attending physician at an early hour the next morning, and renew the application.

At 7 o'clock, the hour of consultation, the next morning, although we found our patient still oppressed by the impeded respiration, yet the breathing was slower, the countenance less anxious, and in no respect was she worse than when we left her the night previous. It was concluded to repeat the cauterization, and the nitrate of silver was again applied freely about the fauces of the child, and to the interior of the larynx; and at this time was the operation followed with even more relief than had attended the previous application.

I did not see the patient after this time, and the subsequent history of the case was furnished me by the attending physician, who stated, in substance, as follows:—That after the application of the nitrate of silver, in the morning, the child discharged a great quantity of ropy mucus, and appeared more relieved of the croupal symptoms than at any time before. At 12 o'clock, when he called, he found the little patient sitting up in the cradle, breathing with more freedom, and "looking as if she might recover." These favorable symptoms continued

until three o'clock, when the hour came for administering the grain of calomel, which, at longer intervals, was still continued.

In doing this, the child resisted with considerable violence; and, caused either by the efforts of the patient, or the irritation of the medicine, this was followed by a spasm, and a return of all the unfavorable symptoms; and these continuing to increase, the death of the child took place a few hours afterwards.

I have always been of the opinion that this case would have terminated favorably if it had not been for the occurrence of the above untoward circumstance.

An examination of the body was requested, but could not be obtained.

It is well known that marked remissions of the unfavorable symptoms will not unfrequently occur in some cases of croup; and this is particularly true with regard to that form of the disease which early assumes the spasmodic character.

But the almost entire relief which for a time followed the employment of topical medication in the suffocative and hopeless stage of the two preceding cases, was certainly unusual, and led to the conclusion that the same measure might prove quite successful if adopted in the access

of the disease, or before the exudative inflammation had extended into the trachea and the bronchial divisions. By the occurrence of the following cases the opportunity was presented for the local employment of nitrate of silver in the early stage of the affection.

CASE III.

Several years ago, a son of Mr. and Mrs. W. of Franklin Street, a fine healthful child of four years old, was attacked with membranous croup, and, notwithstanding the most energetic measures were adopted, died of the disease after a few days' illness. Some time after this, another son, only a little younger than the first was at the time of his death, was similarly attacked, and died of the disease in about the same period of time. In November, 1847, the only remaining child of these parents, an interesting daughter of eighteen months old, was violently seized with the same disease of which her brothers had previously died. Several hours after the occurrence of the croupal symptoms in this case, very late in the evening of Nov. 20th, 1847, I was called to see this child, and found her exhibiting all the symptoms of a severe attack of membranous croup. The heated skin, the fre-

quent, oppressed, and stridulous respiration, the dry and ringing cough, "tussis clangosa," and the appearance of the tonsils and pharynx, which were highly inflamed, and coated with an albuminous exudation, left no room to doubt the nature and the stage of the disorder.

For two or three days before the disease had merged into true croup, the child had been laboring under catarrhal symptoms, which were attended with hoarseness, and a dry, hard cough.

Immediately on my arriving at the house, and finding the patient in the above condition, I determined to try the effect, in this early stage of the disease, of remedies applied directly to the inflamed mucous surfaces. But in order, at the same time, to secure the aid of general remedies, I ordered the administration of a few grains of ipecacuanha, and, after waiting several minutes, followed the medicine with the application of the sponge dipped in a solution of nitrate of silver, of the strength of forty grains to the ounce of water. With this, the fauces, pharynx, and the laryngeal face of the epiglottis were well cauterized, and at the same time the sponge, wet with the solution, was carried into the larynx.

As in the preceding cases, this operation was

followed by a cough, and an effort at vomiting; by which a large amount of glairy, adhesive mucus was discharged, commingled with which shreds of the false membrane were distinctly visible. Within fifteen minutes the child breathed with more freedom, and there was an equally favorable change in the dry and ringing cough. Expecting to repeat the application, I remained a short time with the patient; but there was such an improvement in all the croupal symptoms, that no further application of the caustic was made that night. Five grains of calomel were directed to be given to the child; an emetic of ipecacuanha and tartarized antimony was ordered to be administered in the course of the night, if at any time there should be an increase of the peculiar symptoms of the disease.

At an early hour the next morning I visited my patient, and found she had passed a night of comparative comfort. The respiration was not so laborious as when I left on the previous evening, the cough was less croupal, and the heat of the surface was greatly diminished. The calomel had moved the bowels, and as the patient continued to improve during the night, the emetic was not given.

The same favorable indications continued during the day; but about nine o'clock that

evening a message was received from the alarmed parents, requesting my immediate attendance, for their child, as the messenger reported, was suffering from a return of the croup. I found a recurrence of the same symptoms that had been present the preceding evening; but they were much less in degree, and a single application of the nitrate of silver to the larynx which I made at once, relieved in a short time the embarrassed respiration, and lessened the croupal cough.

The patient again passed a comfortable night, and the next day when I called, she appeared quite cheerful, and apparently almost free from disease. From this time no further medication was needed; the child has since passed through a severe winter without the recurrence of any symptoms of laryngeal disease.

The above case occurred in a family whose children were predisposed to the disease; and in its access and development, the affection presented all the symptoms of true, or membranous croup. With the exception of the small doses of ipecacuanha and calomel which were given on the evening of the attack, no other means were used but the local employment of a strong solution of the crystals of nitrate of silver to the seat of the disease.

During the months of February and March

of the present year (1848), the occurrence of croup among children, in this city, has been more than ordinarily frequent. This is to be attributed, undoubtedly, to the epidemic influence of the atmosphere, which, for some cause, has been in a condition to favor the development of influenza, and other diseases of the respiratory organs, in adults, and of croup in children.

The following cases appeared during this period, and also took place in a family where croup had before occurred, and in one or two instances had proved fatal.

CASE IV.

At a late hour in the evening of the 23d of February, the Rev. Dr. B——, of this city, called at my office and desired me to accompany him, to see his little daughter, a child three years of age, who that evening had been violently seized with an attack of croup.

She had been hoarse, and had had a rough, dry cough for several days previous to the full development of the affection. When I saw her a few hours after the occurrence of the disease, the symptoms of croup, which were present, were marked and severe,—indeed, as I entered

the hall of the house, the ringing cough and stridulous respiration of the child—sounds which no physician ever desires to hear a second time, were distinctly audible through the closed doors of the chamber above.

With the aid of Dr. J. Hancock Douglas, who was in my office when the father of the sick child called, and who accompanied me to his house, I succeeded in obtaining a good view of the throat of the little patient. The parts were highly inflamed, and the tonsils were covered with an albuminous exudation. The barking cough and the embarrassed and tracheal respiration plainly indicated the stage of the disease, and that the inflammation had extended to the larynx, and about the vocal chords.

As no time was to be lost, I immediately administered ten grains of ipecacuanha, and after waiting fifteen minutes, prepared to cauterize the diseased parts.

Assisted by Dr. D——, I applied a solution of the nitrate of silver (forty grains to the ounce) to the fauces and pharynx, and also introduced the sponge saturated with the solution, into the cavity of the larynx. The introduction of the instrument was followed by a free discharge of muco-fibrinous matter, in which, and also on the

sponge, were shreds of the membranous deposit.

The little patient, very soon after the operation, appeared greatly relieved.

We remained nearly an hour after the application, in order to repeat it if the symptoms should indicate its necessity; but the child continuing to improve, we left for the night, after giving directions to have an emetic of ipecacuanha administered should there be any increase of the embarrassed respiration. Soon after we left the child fell asleep, and although the breathing was labored, and the cough, which occurred often during the night, was croupal, yet she slept for several hours, and when I called the next morning, I found a great improvement in all the above symptoms. The emetic had not been given. As there still appeared to be some inflammation about the throat, and the cough retained the peculiar sound of the disease, I had fears that there might be a return of all the unfavorable symptoms before night, and therefore concluded not to wait, but to repeat the application of the nitrate of silver to the diseased organ. This was done, and I feel confident the operation was attended with much advantage, for instead of having a recurrence of the croupal symptoms on the second night, as had

occurred in a former instance (Case iii.), and which is so likely to follow a remission of the disease in most cases, there was a constant improvement of all the croupal symptoms during that day, and the following night was passed with equally favorable indications.

In short, after this date no further medication was needed, for the child rapidly recovered.

CASE V.

While in attendance upon the above case, a second child in this family, a little daughter, nearly eight years of age, was likewise attacked with the disease.

It had been observed by the mother, that she, like her younger sister, had been hoarse with a severe cough for a number of days. For these symptoms, occasional doses of syrup of ipecacuanha, or of Hivè syrup, had been administered by the parents. But notwithstanding the use of these expectorants, croup supervened on the above symptoms, which, although well marked, was not developed with quite that degree of severity that attended the onset of the disease in the preceding case. Being at the house soon after the access of the disease, I applied the

cautery immediately to the inflamed mucous surface of the throat and larynx.

It will be unnecessary to repeat the details of the treatment in this case. Two applications only were made on the evening of the attack, and one on the following day. The only general remedy administered, was a laxative dose of calomel. The croupal symptoms, which were greatly lessened by the first and second applications, disappeared altogether after a single employment of the local remedy on the second day.

CHAPTER III.

MEMBRANOUS CROUP, COMPLICATED WITH BRONCHIAL INFLAMMATION.

The preceding cases of croup, with the exception perhaps of the first, may be termed instances of laryngeal, or tracheal forms of the disease. The bronchial variety, or that form of croup which is complicated with inflammation of the bronchial tubes, is described by most authors as commencing with catarrhal symptoms. There is, soon after the access, and in some instances from the invasion of the disease, a croupy character of the voice, dependent upon the exudative inflammation which distinguishes it from a purely catarrhal or bronchial affection. This distinction, be it remembered, is not founded upon any pathological difference in the nature of croup, for it is maintained that the peculiar inflammation of croup has its origin in the superior parts of the respiratory passage; and that this inflammation, if continued, will extend not only along the trachea, but into the ramifi-

cations of the bronchi; and we then have the sibilous respiration, the suffocative cough, and the lividity of the countenance, which distinguish this complicated form of the disease.

The danger of an unfavorable termination, it is considered by Ryland and others, will be in proportion to the rapidity with which these several stages follow each other.

Although the chances of success, in the employment of the nitrate of silver as a topical remedy, are greatly diminished when the exudative inflammation has extended into the bronchi, yet, as the application of it does not preclude the adoption of other measures, its employment, even when there is a predominance of bronchial symptoms, should in no wise be neglected.

In the following case, though unsuccessfully employed in the advanced stage of a case of bronchial croup, yet such was the effect of the nitrate of silver, in mitigating the croupal symptoms, and in relieving the oppressed and stridulous respiration, as to encourage perseverance, and awaken hopes of final success, in some cases of the complicated variety.

CASE VI.

Feb. 28, 1848.—Was requested to meet Dr.

Spears, in consultation, in a case of croup, in the daughter of Mr. N., of Sidney Place, Brooklyn.

This child, aged two and a half years, had exhibited, as I learned from the attending physician, symptoms of croup complicated with catarrhal or bronchial disturbance, for nearly a week before the full manifestation of the disease. During the last twenty-four hours all the symptoms had become greatly aggravated, notwithstanding appropriate and energetic measures had been employed, by the attending physician, to check the progress of the disease.

I found the child oppressed with a most difficult and laborious respiration; there was great restlessness; the voice was reduced to a whisper; whilst the choking cough, the livid lips, the constant heaving of the thorax, and the sibilous respiration, indicated the complicated nature of the case, and the advanced stage of the disease.

After examining the case, I expressed my fears that permanent benefit would not follow the employment of topical remedies at that stage of the affection, especially as applications could only be made to a portion of the diseased membrane. As the attending physician and the parents were anxious to have a trial made, I

applied a strong solution of the nitrate of silver to the fauces, pharynx, and on both faces of the epiglottis; and then, after a delay of ten minutes, I passed the sponge of the probang through the aperture of the glottis, and freely cauterized the interior of the larynx. For a few moments the cough was more violent, and the respiration appeared more embarrassed. But during this time, a large quantity of muco-purulent matter was discharged, or was wiped from the mouth of the patient, commingled with which were many patches of false membrane.

The respiration, soon after this, was much easier; but more especially was this the case, after a second application, which was made in the course of half an hour, and which was followed by a like free discharge of viscid, yellow mucus, and a decided improvement in the choking, croupy cough, and respiration. Indeed, although this patient did not ultimately recover, the symptoms of tracheal croup were at no time thereafter so severe, as before the nitrate of silver had been applied to the parts.

These applications, conjoined with appropriate general treatment, were repeated at intervals for several days, and always with more or less relief to the embarrassed respiration; but the bronchial affection continuing, pulmonic inflamma-

tion supervened, and the child sank under the disease, and died on the thirtieth of the month, although the peculiar symptoms of croup, as the attending physician informed me, had nearly disappeared before the death of the patient.

I have alluded to the difficulty of reaching the whole surface of the diseased membrane, where, as in the preceding case, the exudatory inflammation has extended through the larger bronchi into their minute ramifications. But, even when this is the case, we should not be deterred from the employment of the nitrate of silver as a topical remedy, if it shall be found that, when it can be applied, its influence upon the mucous membrane is always salutary; for, it is now an established fact, that a solution of nitrate of silver, of sufficient strength to arrest inflamed action, may be introduced in considerable quantities below the epiglottis of adults, and thus be diffused with certainty over the surface of the bronchial membrane.

Among the patients who during the last few years have come under my care, for the treatment of chronic, laryngeal, and bronchial disease, are a number of intelligent physicians. Several of them have informed me, repeatedly, that after having a few applications of the solution of nitrate of silver into the larynx, they have felt the

fluid distinctly extending down the bronchial tubes. Often, in these cases, no taste of the medicine would be observed, until matter, by coughing, was expectorated from the air-passages, when the peculiar flavor of the nitrate of silver—a most acrid bitter—would be perceived; and this would continue to be observed, whenever the individual expectorated, for many hours after the operation; thus conclusively demonstrating, as it did, to those gentlemen, that the solution had pervaded the bronchial divisions. Another point, connected with this matter, is the interesting fact, that much less mechanical irritation is produced by the application of the nitrate of silver into the larynges of young children, who are suffering from croup, than when it is introduced into those of adults, who are affected by chronic disease of the larynx.

In applying this remedy, in the preceding case, it was observed by Dr. Spears, with much surprise, and the same fact has been remarked by myself in other cases, that after the first application of the solution to its larynx, this child, as if fully conscious of, and seeking for the relief it afforded, would open her mouth to receive the probang, whenever the physician approached for the purpose of repeating the operation.

In the treatment of croup, therefore, where the plastic exudation has extended into the ramifications of the bronchi, or where the primary affection is complicated with bronchial disease, a still more free use of the solution should be employed, in order that some part of the fluid may find its way over the diseased mucous surface of the lesser branches of the air-tubes.

Acting upon this plan, the following case of croup, complicated with bronchial disease, was successfully treated by the topical employment of the nitrate of silver.

CASE VII.

In the early part of the spring of the present year, M. M. of this city called on me, and requested me to visit his little daughter, who, under the care of his family physician, had been sick with the croup for nearly a week, and was then dargerously ill.

One or two of his children had already died of croup, and the array of symptoms which I found here presented, indicated an equally unfavorable termination of the disease in the case of this child. From the history given, as well as from the symptoms present, I found that bronchial inflammation had become complicated

with the croupal affection soon after the attack. The symptoms present at this stage of the disease were not dissimilar to those that existed in the latter stage of the case last recorded. There was oppressed and stridulous respiration; the voice was reduced to a whisper; the characteristic croupy cough was present, but more suffocative and bronchial than when occurring in simple croup; and complicated with these symptoms were further indications of extensive bronchial disease. Throughout the left lung especially, of this patient, the sibilant respiration and other evidences of the affection were most apparent.

The ordinary general treatment usually adopted in such cases had been judiciously and perseveringly employed for several days by the attending physician, apparently without arresting in any degree the progress of the disease.

I proceeded at once to cauterize the diseased organs, and having applied a strong solution of the nitrate to the fauces, pharynx, and about the glottis, passed the sponge well filled with the fluid into the cavity of the larynx. As had occurred in other cases, this operation was followed by a free expectoration of muco-purulent matter, large quantities of which adhesive discharge were wiped from the mouth of the

patient, in which, and adhering also to the sponge of the probang were many small fragments of the false membrane.

These first applications were made about four o'clock in the afternoon; at eleven o'clock at night they were repeated, when other portions of the adventitious membrane were ejected; and within half an hour after the last application, there was a decided improvement in all these unfavorable symptoms.

As the child was greatly enfeebled, not only by the severity of the disease, but from the energetic practice which had been employed, a stimulating expectorant was the only remedy ordered; anodyne and slightly irritating fomentations were applied to the chest; and a bland, supporting diet was directed.

On calling at an early hour the next morning, the attendants reported the patient as having passed a better night than had occurred to her since the first attack of the disease; and the appearance of the child indicated a favorable change in all the unpromising symptoms. The breathing was much less embarrassed, the pulse and respirations were diminished in frequency, and the cough had nearly lost its croupy character.

The same plan of treatment was continued,

and from this period the patient recovered rapidly; and although it was several days before the voice was restored, yet vocalization returned, and the child was ultimately restored to robust health.

CHAPTER IV.

MEMBRANOUS CROUP COMPLICATED WITH SPASMODIC AND WITH BRONCHIAL SYMPTOMS.

It has been stated in the preceding pages, that that form of croup which some writers have denominated the spasmodic variety, is in fact different from the true inflammatory croup only in this respect, namely, that in such cases there is a greater predominance of spasmodic and nervous symptoms, whilst, on the other hand, there is a tardier tendency to the formation of an adventitious membrane.

There is not a doubt, that in such instances as the following, patients are frequently cut off by the violence of the spasm before the plastic exudation has become in any degree condensed into a continuous membrane; and it is from an examination of the morbid appearances manifested in similar cases that some writers have been led to adopt the conclusion, that there exist two distinct forms of the disease, in the pathology of which there is an original and essential difference.

CASE VIII.

On the night of the 1st of April, 1848, I was desired by Mr. Hall, of Amos Street, to visit his son, a fine healthy fat boy, five years of age, who had an attack of croup. The disease had come on after an unusual exposure to the cold easterly wind which had prevailed during the preceding day. Early in that day the child had been allowed to stand for an hour or more at an open window, engaged in watching some boys who were flying their kites near by, until he was quite chilled by the cold atmosphere. The attack of croup, as might be anticipated, in one predisposed to the complaint, followed this exposure. This case was first seen by me about three hours after the development of the disease. The symptoms at this stage of the affection were uncommonly violent. The cough was croupal; the face flushed; the respiration was accelerated, stridulous, and greatly oppressed; so much indeed was the breathing embarrassed, and so great were the struggles for breath, that it was with much difficulty that the child could be held in his mother's arms.

On examining the throat of the patient no patches of the false membrane could be discovered about the tonsils, but the whole faucial re-

gion was coated with a viscid exudation, and was, moreover, in the highest state of inflammation. Here then was a case where severe spasm existed in the early stage of exudative inflammation, before the fibrinous deposit had assumed a concrete form. Every physical or rational symptom of true membranous croup was manifested in this case in a prominent degree, except the formation of the pellicular membrane, and this unquestionably would have been deposited in a short time if the morbid action had not been arrested.

In order to excite vomiting the Syrup of Ipecacuanha had been administered to the patient before my arrival, and at the suggestion of an officious neighbor, this had been followed by an infusion of lobelia, but no effect had been produced by either of these remedies.

Finding the symptoms so urgent—for immediate suffocation seemed impending—I determined to try at once and relieve the spasm by local applications to the larynx of the patient. Directing the child's head to be properly confined, I depressed the tongue, and passed a sponge saturated with a strong solution of the nitrate about the fauces and into the cavity of the larynx. A large quantity of ropy and adhesive mucus was quickly thrown off after the application. In a

few minutes the respiration was less suffocative, but not until after a second application, which was made within twenty minutes of the first, was the relief marked and decisive. In less than half an hour after the second thorough application of the solution to the diseased parts, the child fell asleep, breathing comparatively with but little difficulty.

On calling the next morning to see my patient, he was found looking pale but cheerful, and was engaged at his play. He had passed the latter part of the night in a quiet sleep. His voice, although sounding hoarse when he coughed, was nearly restored ; his pulse was natural, and his respiration almost wholly unembarrassed. The emetic had not been administered, nor was any other medical agent whatever employed in this case, after I was called, but the local application of the argentine solution to the mucous surfaces of the fauces and larynx. The recovery was rapid and permanent.

In this connexion, I shall detail the treatment of but one other case of membranous croup as having come under my own immediate observation.

The interest connected with the following successfully treated case of membranous croup is enhanced by the fact that besides being one

of the most severe and complicated cases of the disease that I have ever encountered, its progress, treatment, and the effect of the treatment employed, were observed by several intelligent physicians, not one of whom considered it possible to save the life of the child by means ordinarily employed in the treatment of croup.

CASE IX.

The daughter of Mr. Griffin, of Hudson st., came under my care for the treatment of croup, April 26th, 1848.

This child, who was three years and one month old, had been affected with a severe cold, which was attended by a hoarse cough for a whole week before the occurrence of the suffocative and alarming symptoms which characterize the full development of the disease. I was called to see this child on the morning of the 26th, and found the catarrhal symptoms present as above named. The hoarse cough, the heated skin, the restlessness, and the increased respiration of the child, awakened in my mind the suspicion that the patient was threatened with an attack of membranous croup.

Small doses of calomel and ipecacuanha were ordered every three hours during the day, these

to be alternated with a weak solution of tartarized antimony. But I failed to do what should not have been omitted at this visit, namely, to examine the throat for the purpose of ascertaining the presence of the false membrane, if it existed; for I doubt not from the subsequent course and character of the disease, that its presence about the tonsils could have been detected at this stage of the affection.

About 8 o'clock of the following evening, I was sent for in great haste to see the child, and found her laboring under a most violent and fully developed attack of membranous croup. The flushed countenance, the accelerated pulse, the ringing cough, the oppressed and stridulous respiration, and the appearance of the fauces, which were entirely coated with a membranaceous deposit, made it impossible to mistake the nature or the grade of the disease.

The medicine being at hand, I immediately administered an emetic dose of ipecacuanha and antimony, and after a delay of fifteen minutes, the patient not vomiting and the respiration being greatly embarrassed, I proceeded to employ cauterization. A sponge dipped in a strong solution of nitrate of silver was applied to the tonsils, the mucous membrane of the pharynx, and then passed rapidly over the laryngeal face

of the epiglottis and into the larynx itself. This operation was followed by immediate vomiting, and the ejection of a large quantity of tenacious, glairy mucus from the air-passages, in which could be seen many broken portions of the false membrane.

After a few minutes, the patient breathed with more freedom; but this partial relief continued for a brief time only, for at the end of half an hour the cough became more stridulous, and the respiration more embarrassed than it was before the application of the topical remedy. An emetic of sulphate of zinc in combination with ipecacuanha was now administered, by which full vomiting was produced.

As no permanent relief, however, followed these measures, but the disease on the contrary appearing to advance, I proposed a consultation, and Dr. Cox, of Union Place, was called.

It was concluded in consultation to continue the topical applications, to administer small and frequently repeated doses of tartarized antimony, and to give two grains of calomel every second hour. The second cauterization was made at 10 o'clock, which brought away an increased amount of the adhesive mucus, and many shreds of the pellicular formation. The antimony, although given in large doses during the night, did not produce vomiting. This was

only effected by administering the zinc and ipecacuanha, and whenever the above combination was given, it never failed to act as an emetic.

A third application of the caustic was made a little before midnight, and my assistant, Dr. Douglas, remaining with the patient through the night, repeated the cauterization for the fourth time, about two o'clock in the morning. At each application much mucus was discharged, commingled with which were many portions of the adventitious membrane. In every instance the operation was certain to be followed by a mitigation, to a greater or less extent, of all the distressing symptoms—the difficulty of breathing, the quickened pulse and respiration, would be for a time greatly diminished; but not until after the fourth application, did this relief continue for any length of time. When I returned to the patient at five o'clock the next morning, I observed a marked change in the symptoms that were present. The croupal cough and the stridulous breathing were much lessened, but on the other hand, the increased heat of the surface, the bronchial cough, and the widely diffused râles, which were revealed by auscultation throughout both lungs, indicated too plainly that the exudative inflammation had extended into the bronchial terminations.

At the consultation held soon after my first visit this morning, it was concluded to have a few leeches applied between the shoulders of the patient with the hope of arresting the bronchial inflammation : to continue the calomel, and to repeat the topical measures during the day should there be an increase of the croupal symptoms. During the early part of the day, the case appeared to be somewhat improved by the bleeding and the other measures adopted ; but towards night, the croupal symptoms returned with more violence than ever ; and complicated with this we had extensive bronchial disease, occupying both sides of the chest. A blister was applied over the sternum, the topical applications were renewed, and the patient again vomited with the mineral emetic. Many portions of albuminous matter were again ejected by these measures, which served to relieve greatly the stridulous breathing ; but by 10 o'clock at night, the respiration became more bronchial and rapid, the pulse was increased in frequency, and feeble ; and although the croupal symptoms were decidedly relieved by the local applications, yet the little patient appeared to be fast sinking under the suffocating effects of the bronchial disease. In consultation with Dr. Cox it was concluded that depletion, even by vomiting, could be carried no further, and that the spasm

and bronchial irritation must be relieved, if at all, by other measures. It was decided, therefore, to continue the cauterizations as required, and to administer the Hydrocyanic Acid, in drop doses, every two hours. The excellent effects of this latter remedy were soon apparent. After two or three doses had been swallowed, the great restlessness, the almost constant suffocative cough, subsided greatly, and the ejection, after an application of the caustic, of a much larger amount of fragments of the false membrane than had before been discharged, afforded the greatest relief; so that towards morning, the child fell asleep, and for two hours slept quietly, and breathed with considerable freedom.

The next day the child appeared much prostrated, but the croupal symptoms had nearly disappeared, and the bronchial irritation was greatly lessened.

The Hydrocyanic Acid was continued for several days. Appropriate supporting means were employed, under the use of which the little patient was gradually restored to health and strength.

But notwithstanding convalescence took place in other respects, yet vocalization did not return till nearly eight weeks after the attack of the disease.

Pathologists have observed that croup usually

subsides after the occurrence of a single process of exudation; but cases are recorded where the inflammation has continued until the formation of a second, and even a third adventitious membrane.

Such was the severity and persistence of the exudative action in the preceding case, that, as we had every reason to suppose, several successive layers of albuminous matter were formed in the larynx, and removed by the applications. Repeatedly, during the period of the greatest severity of the disease, after these cauterizations were made, many patches or fragments of the false membrane, some of considerable size, were at each time ejected from the air-passages. This occurrence was always followed with relief to the patient, and this relief would continue until the deposition of another membranous coating had taken place.

I shall conclude, for the present, my record of observations, by noticing a few cases of membranous croup which, in the hands of other members of the medical profession, have been successfully treated by means of the topical application of the nitrate of silver.

Within a few days the subsequent highly interesting case was communicated to me by my friend, Dr. James Bryan, of Philadelphia.

CASE X.

"*Dear Doctor*,

"The following case of membranous croup, cured by the application of nitrate of silver, I send to you in accordance with your request. You are at liberty to make whatever use of it you may think proper.

"On the 21st of April of the present year, I was called upon by my friend Dr. T. Beasley to see with him the only child of Thomas Hutchinson, aged 14 months, laboring under an attack of croup.

"Dr. B. informed me that this was the third day of the disease, and that the child had gradually grown worse, until the disease assumed the features presented at this visit.

"I fastened on the extremity of a properly bent whalebone a conical piece of sponge, and prepared a solution of the nitrate of siver, 40 grains to the ounce of water. At seven o'clock, P. M. the child was lying on its back with the head thrown backwards spasmodically, and breathing with the greatest difficulty; the lips livid, the pulse small, thready, and very quick; a peculiar whistling sound was produced by the imperfect act of respiration. The fauces and throat, as far as vision, aided by depressing the

tongue, would extend, were covered by a white, milky, sheet-like covering. The child was placed on the father's lap, the head supported by Dr. B., when I depressed the tongue by means of the bent handle of a silver spoon, and introduced rapidly into the larynx the sponge, saturated with the solution.

"For an instant the spasm of the glottis produced apparently complete closure. This, however, was followed by relaxation, and a copious discharge of mucus, with long membranous shreds, which relieved the respiration very much.

9½ o'clock, P.M.: The child has vomited freely in the interim, and respiration is some better. The application was made again, and was followed by a temporary spasm, and a copious discharge of a flaky and stringy mucus, as white almost as milk. A little blood was found mixed with it, which came apparently from the nose, which has been discharging blood every now and then since the commencement of the disease.

22d, 8 o'clock, A.M.: The child has passed a tolerably easy night. Free bilious discharges have taken place from the bowels, produced by the use of two grains of calomel taken every two hours since yesterday morning. Respira-

tion now is comparatively easy, the head is not thrown back as before, nor are the lips so livid. The child is enjoying a quiet sleep. The pulse is about 90, and regular. Ever since the first application, it has drunk freely of cold water, which it did not before.

The third application into the larynx produced less spasm, and very little irritation, but it was followed by a very free expectoration of the same kind of shreddy and membranous substance, with a large amount of mucus. Continue the calomel two grains every few hours.

7 o'clock in the evening: The child has had four stools during the day, is now lying languidly on the pillow with its chin raised, but quiet. Respiration dry and difficult.

"On account of the excitement of the child, the first attempt to cauterize the larynx was not successful, and it produced, which in fact is always the case, considerable spasm. The second attempt was perfectly successful, the sponge passing down more than two and a half inches, bringing up with it a quantity of white membranous mucus, and followed by a discharge of a large amount of the same kind of matter, almost without any effort of the child, who threw his head back, breathed easily, and went to sleep in a very few seconds.

23d, 8½ o'clock A.M.: The respiration comparatively easy, slept well last night, has had four bilious stools. It is so much easier that we resolved not to apply the caustic at present, but to hold ourselves ready to do it during the day, should there appear immediate necessity for it.

"6 o'clock P.M.: The child was sitting up on its mother's lap, amusing itself with toys. A quantity of coagulated blood fills up the right nostril. Respiration but slightly stridulous; has eaten bread and milk; had three stools since morning, and has slept very comfortably. The throat, as far as can be seen, is perfectly free from the *diphthérite* deposit. Continue calomel, half a grain every four hours, with one grain of Quinine.

"24th: Saw the child this morning with Dr. Beasley. It was lying comfortably in the cradle; very little impediment to the respiration; has slept well during the night, taken nourishment, and passed three stools. The throat shows no appearance of deposit. The calomel diminished to one eighth of a grain every four hours. The consultation to cease.

"It will be recollected that no emetic or other remedy than a few grains of calomel and the nitrate of silver has been administered in this

case until last night, when the Quinine was added. The patient recovered without an unfavorable symptom."

The history of Case II., which is recorded on page 31 of this work, was given at a meeting of the "New York Medical and Surgical Society," November 1st, 1845, and the members present were desired to make trial of the local remedy whenever opportunity for employing it in croup might occur.

The next year a member of the Society, Dr. Wm. N. Blakeman of this city, reported to the Society two cases of croup which had been treated successfully by topical medication.

The details of these cases are recorded in the twenty-third number of the New York Journal of Medicine.

The first case, which is that of a large fat child two years old, and of a leuco-phlegmatic temperament, was seen by Dr. B. five hours after the attack. The skin at this time was hot and dry, the pulse quick, with great restlessness, laborious breathing, and the hoarse barking or crowing sound peculiar to croup. The tincture of sanguinaria with squills, and ipecacuanha, were first given, by which vomiting was produced, with no relief; six grains of calomel

were then administered and the former mixture repeated, with the addition of five grains of tartar emetic; free purging and vomiting were produced, but with no relief. On the second day persulphate of mercury was given in doses of a quarter of a grain every hour, by each dose of which vomiting was excited, but without relief. In the afternoon of the same day Dr. Blakeman resolved to try a strong solution of nitrate of silver. The application was made by means of a sponge, and the solution used contained a drachm of the nitrate to an ounce of water. The application brought away a quantity of tenacious membranous matter, and a larger quantity by the vomiting which soon followed. A second application was made ten minutes after, by which a still larger quantity was brought away, to the great relief of the symptoms. In five hours a third application was made with the same effect as to the discharge of membranous matter and the vomiting. The next morning the child was found entirely relieved from the disease.

In the second case, that of a boy six years old, with frequent pulse, skin hot and dry, breathing hurried and difficult, and loud crowing, the same application was made two hours after the commencement of the attack, when a discharge

of tough phlegm took place and vomiting. After a second application the relief was complete.

Within the last year several other cases of croup have been communicated to me by medical gentlemen residing in different parts of the country, in which they have succeeded perfectly and with great satisfaction to themselves in arresting the disease, by the use of the topical measures I have recommended. I shall, however, in this connexion subjoin the history of but one other case of membranous croup;—one which was successfully treated by Dr. C. E. Ware, of Boston, and was by him communicated to the Boston Medical and Surgical Journal. It may be found in the fourth number for December, 1847.

"I was called," says Dr. Ware, "to this patient, a boy five years old, Saturday, November 20th. The mother said that he began to breathe hard just a week previous, but as he had been subject to attacks of spasmodic croup, in several of which I had attended him, and usually found ready relief, she felt no great anxiety, especially as there was less constitutional affection than he had in former attacks. His tonsils, also, had been for a year or more somewhat enlarged, and often gave a huskiness to his respiration and voice. On Tuesday he

began to cough, and evinced other signs of a cold. These symptoms continued, he playing about, and having appetite without anything very characteristic till Friday afternoon, when the cough began to have a ringing tone, and the respiration to be very labored. I was not called to him till the next afternoon. Then there was the characteristic breathing of croup well marked. It had become sufficiently distressing to occasion great restlessness and jactitation, but was not accompanied by much febrile excitement, nor as yet prostration. The general expression of the child was good. On examining the fauces they appeared red, and the tonsils presented distinct patches of lymph. On the backs there was an almost entire absence of respiratory sound, and no râles whatsoever. The breathing and cough were both dry, with very little râle in the trachea.

He was ordered strong mercurial ointment, and fomentation to neck, and pills of Dover's powder and blue pill once in four hours, and a syrup with opium and ipecac. at intervals between. Under the influence of the opium he got more sleep than during the previous twenty-four hours, but in the morning was no better, nor essentially different.

I now commenced the application of the ni-

trate of silver to the larynx, using a solution of the strength of a drachm to the ounce, and applying it with one of Dr. Green's whale-bone staffs. I applied it twice in the course of the first day. The child the first time resisted violently, and I was obliged to use much force. But after having been persuaded once to submit quietly, the operation occasioned so little irritation that he never afterwards made the least objection to it, but allowed me to perform it as effectually as I could have done upon a grown person. The first applications were followed by so such excitement that it was difficult to see what was the immediate effect. But afterwards, when he was more tranquil during the operation, it was obvious that it produced an increased dryness of the cough and respiration, without immediate relief or aggravation of the labor in breathing. In the course of the day he raised twice considerable pieces of false membrane, very well marked, and stained with blood, together with a great deal of very thick, tenacious mucus, which was also occasionally stained with blood. After the discharge of the false membrane the breathing became much easier, and was never again as labored as it had been before.

The next day, Monday, the respiration, al-

though improved, was still very laborious. There was yet great deficiency of respiratory sound in the backs, and absence of râles. After the application of the caustic, which was applied twice this day, the fauces appeared red, but there was no lymph visible. From this time the amendment, although slight, from day to day was constant, till Friday, the 26th. No lymph was seen upon the tonsils. The caustic was applied once a day. Friday night, the breathing was more labored than the night before, and Saturday morning I again saw lymph on the tonsils. Through Saturday and Sunday, however, he continued to improve, and Sunday evening uttered the first loud word which he had been able to speak since I had seen him. The caustic was now omitted, as well as all his medicines. His appetite, which had never entirely disappeared, became more urgent, and he was allowed to eat freely. Indeed, his diet had been liberal throughout. The respiratory sound gradually returned to the backs, but continued, as it had done throughout, free from râles. The voice continues to improve, but still retains its huskiness. The caustic was applied twice the two first days; afterwards but once a day, the sponge never being introduced more than once at the same visit.

CHAPTER V.

OF THE TREATMENT OF CROUP.

As these contributions to the pathology and treatment of croup are not intended to constitute a complete essay upon the disease, I shall not stop to describe the symptoms or to discuss the etiology of membranous croup, but shall proceed to a more critical examination of both the topical and the general remedies which are indicated in the treatment of this affection.

Topical Medication.—Believing as I do, that topical medication is a measure of the highest importance in the treatment of membranous croup, I shall make no apology for giving to it a more extended consideration.

M. Bretonneau was among the first to recommend and employ the nitrate of silver as a topical remedy in the treatment of membranous croup. He made use, however, of a very weak solution (four grammes of the salt to thirty-two grammes of water), and directed its application to be made to the throat and the opening of the glottis. The instrument he employed, and his method of application, are thus described in a

work by M. Berton, which has recently been published in Paris.[1] "L'appareil est composé d'une éponge fine de la grosseur environ d'une noix, fixée au bout d'une baleine assez forte et recourbée, à la chaleur d'une bougie, à 5 ou 6 centimètres de son extremité et presque à angle droit. L'éponge est imbibée d'une solution de nitrate d'argent (au degré de 4 grammes de ce sel pour 32 grammes d'eau distillée). Elle est introduite dans le fond de la gorge ; l'épiglotte est soulevée et la solution exprimée au-dessus de la glotte."[2]

It will be observed from the above extract that M. Bretonneau makes no attempt to pass the instrument below the epiglottis. The sponge attached to the probang, being saturated with the solution, is introduced into the throat, "the epiglottis is elevated (soulevée) and the solution expressed into the glottis."[3]

The topical application of a solution of the nitrate of silver in membranous croup, has also been recommended by MM. Dupuytren, Trousseau, Guersant, Guiet, Bouchut, and other French practitioners.

[1] Formulaire Thérapeutique, etc. Concernant les Maladies de L'Enfance. Article, Croup.

[2] Ut supra, p. 81.

[3] If the French anatomists will acquaint themselves with the position of the *living* epiglottis when in situ, they will find that this cartilage is always *raised*, except at the moment of deglutition.

M. Guiet, in his Thesis published in 1843, on the treatment of croup,[1] thus describes the method—as practised by M. Guersant in the Hôpital des Enfants—for applying the caustic solution to the fauces, pharynx, and to the opening of the glottis in such a manner as to cause some drops of the solution to penetrate into the larynx. "L'éponge convenablement imbibée de la solution caustique, et le malade solidement maintenu par une ou deux personnes vigoureuses, l'opérateur abaisse la base de la langue, avec la main gauche, armée d'une cueiller ou de tout autre instrument; en même temps il porte avec la main droite, la baleine dans la bouche; lui fait traverser rapidement cette cavité; porte l'éponge dans le pharynx après l'avoir promenée sur les piliers et les amygdales, s'il y existe des fausses membranes; la fait glisser profondément dans cette cavité le long de sa paroi postérieure, de manière à la loger, si c'est possible, entre cette paroi postérieure et l'épiglotte; puis, quand il se sent arrêté par l'orifice supérieure du larynx, il presse un peu sur cette éponge, de manière à en faire suinter quelques gouttes de solution caustique, et à en faire parvenir un peu dans le larynx."[2]

[1] Considerations Pratiques sur le Traitement du Croup. Par P. R. L. Guiet, p. 22.

[2] Op. citat. p. 22.

The same author informs us that Professor Trousseau at the Hôpital Neckar has employed with success a solution of the nitrate of silver as a topical remedy, in the treatment of a case of croup occurring in an infant of 20 months; but to what extent the applications were made, or of the exact strength of the solution employed, we are not informed.

M. Bouchut, whose work on Diseases of Children[1] was published in 1845, alludes to this case of M. Trousseau, and adds that two other well marked cases of membranous croup in private practice had been successfully treated, by means of the above local remedy. The strength of the solution as recommended by Bouchut, is ten grammes of the nitrate of silver to thirty grammes of distilled water. The instrument of the operator, and the manner of applying the caustic in pseudo-membranous croup, is thus described:—"Il faut avoir un pétite éponge fine, solidement fixée au bout d'une baleine courbée en crochet; lorsque l'éponge est imbibée, on exprime légèrement et on la porte dans le pharynx et sur la glotte, afin que quelques gouttes du liquide caustique puissent pénétrer dans le larynx."[1]

[1] Manuel Pratique des Maladies des Nouveaux-Nés, et des Enfants à la Mamelle.

[2] Op. citat. p. 271.

The application of the caustic, says the above writer, should be made in the commencement of the disease, or as soon as we perceive patches of the false membrane about the pharynx, and it should be repeated at least twice in the twenty-four hours. But he observes, and recommends, great caution in making the applications to the pharynx and over the glottis, lest too large a quantity of the liquid should drop into the larynx, and produce suffocation and death; or, at least, render it necessary to practise immediate tracheotomy. The following are the author's remarks on this subject:—"Si la cautérization de l'arrière-bouche et de la partie supérieure du larynx est avantageuse, elle a aussi ses inconvénients qu'il faut connaître pour tâcher de les éviter. La suffocation immédiate peut en être la consequence, si l'on a laissé trop long temps l'éponge sur la glotte, et si une trop grande quantité de liquide a pénétré dans la larynx. Cet accident est fort grave, car il peut déterminer la mort, ou au moins la nécessité de pratiquer aussitôt la trachéotomie."[2]

Bearing in mind these dangers, and advising great caution in its use, M. Bouchut commends the employment of the nitrate of silver as an important medication in the treatment of croup.

[1] Op. citat. p. 272.

And yet, neither Bouchut nor his confrères, to whom allusion has already been made, derived that benefit from the use of the nitrate which they might have obtained, by carrying their applications directly into the diseased larynx, instead of making them, as they do, only to the pharynx and the superior opening of the larynx —"l'arrière-gorge et l'ouverture supérieure du larynx."

In employing the nitrate of silver as a topical remedy in the treatment of diseases in young children, I have not deemed it prudent or necessary to use a solution of the caustic of the strength recommended by Bouchut or Guiet. The former employed a solution in the proportions of one of the salt to three of water; the latter, in the treatment of membranous croup, made use of a still more concentrated solution; namely, equal parts of the nitrate of silver and distilled water. Ordinarily, I have applied in croup, a solution composed of from two scruples to a drachm of the salt, dissolved in one ounce of distilled water. A remedy of this strength I have applied freely to the fauces, pharynx, and into the larynx of young children, in a large number of cases during the last eight years, and in no single instance have I observed any indications of the danger of suffocation from its

employment. On the contrary, I have repeatedly observed, and have once before remarked, that much less bronchial irritation is produced by the application of the nitrate of silver into the larynges of young children who are suffering from croup, than when it is introduced into those of adults who are affected by chronic disease of the larynx.

In cauterizing the cavity of the larynx in the above disease in adults, I have advised on a former occasion,[1] that the aperture of the glottis should not be passed until after the parts in the faucial and pharyngeal region had been prepared by having the solution applied for a few times to the pillars of the fauces, the epiglottis, and about the opening of the glottis. Proceeding in this manner, it has been shown that the instrument may then be passed into the larynx without producing half the amount of that irritation which its introduction below the epiglottis would have awakened without these preparatory steps.

Happily, it is not necessary to take these precautionary measures before employing the topical remedy, in the treatment of croup in children;—for, as we have seen, applications of the argentine solution of a proper strength may be employed without apprehension in these

[1] Treatise on Diseases of the Air-Passages, etc., p. 199.

cases; and these applications should be made promptly to the tonsillary and pharyngeal regions, whenever the symptoms present indicate the commencement of the exudative inflammation in the mucous membrane of these parts.

The instrument which I have ordinarily employed for making direct medicinal applications to the fauces, and into the cavity of the larynx, in the topical treatment of croup, is one composed of whalebone, about ten inches in length, slightly curved at one end, to which curved extremity is securely attached a small round piece of fine sponge. *(See Plate.)*

Care should be taken that the sponge be not only firmly fixed to the rod of whalebone, but that it be not of a size too large to pass the aperture of the glottis. Anatomists are aware that there is but a very slight difference in size between the larynx of a child of two years, and twelve years of age; and that, at this period of life, the calibre of the tube is from three-eighths to half an inch in diameter; consequently, if the sponge be formed so as not to exceed one third, or one half of an inch in diameter, it can be made, with slight pressure, to pass the aperture of the glottis, and to enter the laryngeal cavity.

The instrument being prepared, by suitably saturating the sponge with the solution to be

applied, and the head of the child being firmly held by an assistant, and the base of the tongue depressed with a spoon, or any other suitable instrument, the operator carries the wet sponge quickly over the top of the epiglottis, and on the laryngeal face of this cartilage; then, pressing it suddenly downwards and forwards, passes it through the opening of the glottis, into the laryngeal cavity. If any patches of false membrane are to be observed upon the pillars or tonsils, the sponge should be passed freely over these parts, and also upon the posterior wall of the pharynx.

Not unfrequently, if topical measures are employed in the very onset of the disease, and before the exudative inflammation has extended much into the larynx, the affection may be arrested by one or two applications of the caustic solution to the fauces, and the opening of the glottis, without ever passing the instrument upon the mucous surfaces of the larynx.

In March, 1847, Dr. P., of this city, called at my office, and requested me to visit, with him, a young child, about two years old, who that evening had been attacked with croup. This child had been indisposed for several days, with a cold, and some slight affection of the bowels,

but not until that afternoon and evening had symptoms of croup been present.

We found the patient with a croupal cough, stridulous and laborious respiration; and, indeed, presenting unequivocal indications of the presence of the disease. The attending physician had administered an emetic, and had adopted other ordinary measures, before calling for me. Discovering evidences of plastic inflammation about the throat, I advised the immediate application of the caustic to these inflamed parts, and, at the request of Dr. P., I applied a solution of the strength of forty-five grains of the salt to the ounce of water, to the tonsils, the posterior wall of the pharynx, and about the aperture of the glottis. Intending to follow this application with a second, and to carry the sponge into the larynx, if necessary, I remained a short time for this purpose; but, in less than half an hour after the first cauterization, the respiration became less embarrassed, the cough less croupal, and I left without repeating the local remedy. The next day, Dr. P., who remained with his patient all night, called and informed me that the child breathed with considerable freedom, and slept well a part of the night; that early in the morning, the respiration becoming again more stridulous, he deemed it advisable to make a

second application of the caustic solution. After this was done, the croupal respiration and other symptoms of the disease subsided rapidly, and, by afternoon of that day, had all, or nearly all, disappeared.

Having seen, on several occasions, the local application of the nitrate of silver act promptly and efficiently in arresting exudative inflammation in its formative stage, I have been led to consider it of the highest importance in the treatment of membranous croup, that the first indications of the disease should be observed, in order that, by the early employment of this local remedy, the specific inflammation may be arrested before it shall have extended into the larynx and bronchial divisions.

It is well known to the experienced practitioner that in many cases of membranous croup, the disease will come on in a manner so stealthy that plastic lymph will be found in some instances coating the tonsils and pillars of the fauces, before alarm has been awakened by the patient having manifested any rational symptoms of croup, unless it be those merely of a common cold, or slight hoarseness of the voice. It is seldom, indeed, that much hoarseness attends the ordinary cold of young children. When, therefore, this symptom is observed to be present, in

catarrhal disease, especially if the child exhibiting it, is of a family predisposed to croup, the physician should never omit to examine the throat of such a patient, in order to detect, and, if necessary, to be able to combat the earliest manifestations of exudative inflammation. During the more than ordinary prevalence of croup in this city last winter, a physician of my acquaintance, whilst attending, in consultation, a fatal case of the disease in a family where one or two had already died of this affection, observed that another child, although apparently perfectly well, and engaged at his play, exhibited a slightly raucous condition of the voice; and, calling the child to him, found, on examination, the throat to be inflamed, and the pillars and tonsils to be coated with several distinct patches of albuminous deposit.

The attention of the attending physician was called to these facts, and the threatened danger from such indications, pointed out. But, as the child had made no complaint, and the parents, on being questioned, had observed no cough, or any other symptoms of indisposition in their child, the doctor believed that no cause of alarm existed, and, in a pleasant way, was disposed to laugh at the apprehensions of his professional brother. They proved, however, to have been

too well founded, for, in less than three days from that time, the child was dead of croup.

If we admit that the peculiar inflammation of croup has its origin, ordinarily, about the tonsils, and the opening of the air-tubes, we can understand how readily the application of the nitrate of silver to the parts about the larynx, may arrest the disease, if the topical remedy is employed in the commencement of the exudative process.

After the inflammation has advanced, and the surfaces of the larynx have become involved in the disease, the argentine solution should not only be applied to the tonsils and to the faucial region generally, but the applications must be extended into the laryngeal cavity.

If the exudations are not already formed into adventitious membrane, the employment of a few successive applications below the epiglottis may be sufficient to arrest the plastic inflammation altogether. But even in a more advanced stage of the disease, when, from its continuance, and the severity of the disease, we have reason to apprehend the formation of a false membrane or a "tubular mould," throughout the larynx and trachea, we should not despair of removing the obstruction or of arresting the inflammation.

Mr. Ryland, who advances the theory that

the inflammation in croup has its origin chiefly in the cellular tissue that enters into the composition of the mucous membrane, and not in the muciparous follicles themselves; and that the albuminous exudation is poured out by the secernent arteries of the cellular structure, admits that "after an uncertain interval, the mucous glands become consecutively affected by the inflammation, and secrete a quantity of their proper fluid, which assists in loosening and detaching the false membrane, and, except in a case of relapse, puts a stop to its further formation."[1]

Now, it is to secure and expedite this very sanative process, that I would recommend the prompt application of the caustic solution to the diseased mucous surfaces within the larynx, in order to effect an expulsion of the false membrane which may have formed in that cavity; for pathologists, who have been accustomed to post-mortem examinations of children who have died during the latter stages of croup, have generally found that the lymph is partially detached from the lining membrane by an intervening layer of mucus; "and it has, therefore," adds the writer just quoted, "been considered an important indication to excite the action of the

[1] Op. citat. pp. 144-5.

muciparous follicles, that by largely secreting their peculiar fluid, they may loosen the adventitious membrane and render its expectoration easy."[1]

When called, therefore, to a case of croup in this its second or developed stage of the disease—and unfortunately, it is not until this period of the affection that medical aid is resorted to in a large proportion of the cases of croup—the local employment of the nitrate of silver, conjoined with other appropriate measures, should be entered upon at once.

An application may first be made to the tonsils, and about the opening of the glottis. After a delay of from fifteen minutes to an hour, the operation may be repeated, and the sponge wet with the solution should then be passed into the glottis. The cauterizations may be repeated once in two, four, or six hours, according to the effect produced, and the intensity of the disease.

When the symptoms indicate that the disease has extended into the tracheal divisions, or when the affection is complicated with inflammation of the bronchi, the applications should be repeated more frequently, in order that some of the solution may find its way over the mucous surface of the larynx and trachea into the bronchial divisions.

[1] Op. citat. p. 155.

CHAPTER VI.

DIPHTHÉRITE, OR THE CROUP OF ADULTS.

THERE exists a form of exudative inflammation which M. Bretonneau calls Diphthérite, or the croup of adults, but which is not exactly identical with the croupal inflammation of children. The same parts, however, are affected in both diseases, and they both end in the effusion of plastic lymph; but true croup ordinarily commences with catarrhal symptoms, is more sthenic in its nature, and is confined in its attacks to children and persons before the age of puberty, whilst the above form of disease commences with pain, redness, and swelling of the tonsils and back of the throat generally, and attacks, moreover, individuals of all ages, but those especially who have become debilitated by other diseases.

The diphthérite proves frequently fatal. M. Louis, who, under the name of "Croup chez l'adulte," describes the disease, records only one case in which a cure was obtained by medical treatment. "It causes death," Mr. Ryland remarks, "very rapidly, when the morbid action

has reached the air-passages, because the larynx is always affected;" in Louis's cases the patients never lived longer than from eighteen to thirty-six hours after the moment when we might presume, from the alteration of the voice, that the false membrane had reached the larynx. Diphthérite occurs frequently as an epidemic, and is considered by M. Bretonneau as decidedly contagious, especially when combined with scarlatina, which is one of its most frequent complications.

Still further to illustrate the nature and cause of this disease, and the effects of topical remedies in its treatment, I shall here introduce the two following cases of diphthérite, which have been recorded by Ryland,[1] together with a third, which came under my own observation, and which was brought to a successful termination by means of the topical application of the nitrate of silver to the diseased parts.

CASE XI.

The patient, a strong boy ten years old, began to experience some difficulty of swallowing on the 1st of January. On the 4th, the tonsils were greatly swollen, and, as well as the uvula, were covered with a greyish concretion; respi-

[1] Op. citat. p. 164–5.

ration frequent, and attended by a guttural sound; tumefaction of the cervical glands near the angle of the jaw. Pulse 94 to 96. Application of concentrated muriatic acid to the fauces, and a grain of calomel to be given every hour.

On the 5th and 6th, the state of the patient continued the same, except the swelling of the glands increased.

7th. Deglutition performed with greater ease; tonsils less swollen, but still covered with false membrane; tumefaction of the cervical glands remarkably diminished. The calomel was discontinued.

8th. Swelling of the glands again augmented; inspiration attended by a hissing noise; croupal cough. At eleven o'clock the dyspnœa increased, and death took place. Twenty minutes after death, tracheotomy was performed, and artificial respiration had recourse to, but with no beneficial effects.

Dissection.—The lungs were healthy; the mucous membrane of the bronchi pale; that of the trachea, towards its middle part, partially reddened, and covered with a tubular membranous concretion, which was loose at its lower extremity, but became thicker and more adherent in the larynx, and less so again on the epiglottis.

The whole of the back of the fauces, the upper part of the pharynx, and the posterior orifice of the nostrils, were covered with membranous concretions, having a most intimate adherence to the parts on which they lay.

CASE XII.

A woman aged 72, had, when she was first seen, suffered for some days from sore throat, for which leeches had been applied. On the following day her countenance was flushed and anxious, respiration difficult, and accompanied by a hoarse sound, voice scarcely audible, deglutition impossible, pulse developed, and skin hot.

A few hours after, on examining the throat, a whitish false membrane was observed on the anterior part of the velum palati, and on this being raised, the mucous membrane beneath was bloody; the other symptoms were in no respect relieved.

On the following morning the patient was dying, the respiration shorter and more sonorous, and death occurred soon after the visit.

Dissection.—A very thick false membrane covered both surfaces of the velum palati, extended into the nasal fossæ, and penetrated into the larynx, trachea, and bronchi; it adhered more strongly to the larynx than to the trachea.

CASE XIII.

Early in May, 1847, Mrs. B., of Forsyth st., about 32 years of age, was attacked with measles. She was healthy and robust, before contracting the disease, and was seven months pregnant at the time of her attack.

Nothing unusual occurred during the progress of the measles, until towards the close of the eruptive fever, when Mrs. B. was seized with pain and inflammation of the throat, attended with swelling of the tonsils and fauces generally, and with dyspnœa and great difficulty of deglutition. Her attending physician, Dr. Belcher (Sen.), was immediately called, and finding the above symptoms present, employed both general and local bleeding, and such other antiphlogistic measures as were deemed advisable. But the disease continuing to advance, another physician, Dr. M., of this city, was called in consultation, and other measures were adopted, but without arresting in any degree the progress of the disease.

On the 18th of May, one week after the attack of the diphthéritic inflammation, I was requested to see this patient, in consultation with the attending physicians.

The following was the condition in which I

found her at this period:—She was supported in an upright position in her bed, with her head thrown back and breathing with the greatest difficulty; the lips and face were livid, the countenance anxious; the pulse small and frequent, and the extremities cold; there was a hoarse, croupal cough, with great difficulty of swallowing, and an entire suppression of the voice. On inspecting the throat, the fauces, tonsils, and the uvula, and indeed every part that could be brought into view, were found to be completely coated with a dense false membrane. By depressing the tongue, nearly the whole of the epiglottis was exposed, and that cartilage, as well as the pharynx low down, could be seen covered with the same adventitious deposit, leaving no doubt, from the condition of the voice and the circulation, that the exudative inflammation had not only entered the larynx and trachea, but had reached even the bronchial terminations.

At the consultation it was agreed that as all other means had failed, an attempt should be made to relieve the larynx by topical applications of the nitrate of silver to the diseased mucous surface, and I was requested to make these applications.

Employing a solution of the strength of forty-five grains of the salt to the ounce of water,

I applied it freely to the whole faucial region, and also passed the sponge wet with the solution into the larynx. The patient manifested no uneasiness whatever from the application, and, on being questioned, declared she did not feel it in the least degree. The strength of the solution was now increased up to sixty grains to the ounce of water, and a second and third cauterization was made deep into the cavity of the larynx, all in the space of fifteen or twenty minutes.

It was not until the last application that the patient complained of any irritation having been produced by the caustic solution. Many shreds of the false membrane were brought away by the sponge, and were also ejected by the cough and expectoration that followed the last two applications. So decided was the relief obtained by these operations that the patient begged to have them repeated before we left the house.

A supporting plan of treatment was advised for the patient, and it was agreed to return at six o'clock and repeat the applications.

At the above hour in the afternoon, we found the patient exhibiting symptoms more aggravated than those which were present in the morning; the lips and countenance were of a livid aspect,

the respiration was more stridulous, and the breathing was being performed with still greater difficulty. The relief that followed the first applications had continued for several hours, but for some time before our return in the evening, the above symptoms had been coming on with constantly increasing violence.

At this visit, the applications of the sponge wet with a solution of sixty grains to the ounce of water, were made into the larynx at intervals of five minutes, care being taken at each application to convey below the epiglottis as much of the fluid as the sponge could contain. A large quantity of muco-purulent matter, containing many particles of the false membrane, was ejected by coughing after each cauterization.

Soon after these operations, the patient expressed herself greatly relieved, and we left her, with her respiration much less embarrassed than it was on our arrival; and the following night was passed by the patient with less distress, restlessness, and oppressed breathing, than had been present during either of the two preceding nights.

May 19th. There is still great prostration, anxiety, and stridulous respiration present. The countenance is yet livid, the cough is croupal, and the voice is reduced to a feeble whisper.

But it is concluded, notwithstanding, that our patient has lost nothing, on the whole, during the last twenty-four hours. Some patches of albuminous secretion can be seen about the tonsils, the uvula, and the epiglottis; but it has been detached and removed from many parts of the throat, leaving the mucous membrane beneath thickened and inflamed.

A solution of four scruples of the nitrate of silver to the ounce of water was made, and three cauterizations of this strength were employed during the day. The effect of each application was to produce a free expectoration of albuminous matter, which was sure to be followed with great relief for a longer or shorter period.

May 20th. But little change occurred in our patient throughout yesterday and last night. Four cauterizations were employed during the day and night, which caused the ejectment of much adhesive mucus, with membranous fragments. Some rest was obtained, but great restlessness, feeble pulse, cold extremities, and oppressed respiration, were present during the greater part of the night.

On examining the patient's throat to-day, it was found that the coriaceous deposit was almost entirely removed from the tonsils, uvula,

and epiglottis, yet the embarrassed and sibilous respiration, the great anxiety, and the livid countenance of the patient, plainly indicated that the false membranes were still obstructing the air-passages below, and were thus preventing the perfect arterialization of the blood; it was therefore determined to carry the cauterizations deeper into the trachea than had yet been done.

In the presence of Dr. Belcher, the attending physician, and my friend Dr. S. Conant Foster, who had accompanied me to see the case, I passed a sponge, saturated with a strong solution of the nitrate of silver—eighty grains to the ounce—through the rima-glottidis, and along the whole length of the trachea. The withdrawal of the probang was followed by a severe fit of coughing, and the expectoration of a great quantity of muco-purulent and membranaceous matters.

Soon after this last operation, the patient appeared greatly relieved, and breathed with more freedom than she had done at any time since her first attack. The same application was repeated at evening, and from this time her recovery was rapid. The cauterizations were continued every day for nearly a week longer,

when the consultations were discontinued, as the patient was considered out of danger.

Mrs. B—— recovered perfectly, and was delivered of a healthy child at her full time; but vocalization did not return until many weeks after her restoration to health. It has since been fully restored.

I am fully sensible that, in the treatmeut of croup, the removal of the false membrane simply is not, after all, the only indication of importance; for, it has been shown repeatedly, from the dissections of those who have died of the disease, that death has not occurred as the result altogether of the obstruction presented by the adventitious membrane, inasmuch as it has been found in many such cases, that within the membrane a space was left for a current of air, sufficient to support life. But, the same exudative process which results in the spreading of a false membrane over the mucous surface of the larynx and trachea, will, if allowed to progress, inflame the whole bronchial divisions, and block up and distend the ramifications of the bronchi and the lungs with serum and puriform matter; and in this way will effectually prevent the arterialization of the blood To arrest, therefore, this

morbid condition of the mucous membrane, which causes the generation of these albuminous exudations, is an indication of the highest importance. Now, from the well-known therapeutic effects of the nitrate of silver upon inflamed mucous tissues, and from my own experience in its use, which is not a limited one, I can with confidence recommend it as the most efficient and certain of all topical agents for effecting this very purpose. So salutary, indeed, have I been led, in my experience, to consider the effects of the nitrate of silver when topically applied to the mucous membrane, and its cryptæ, in plastic inflammation, that for several years I have not hesitated to employ it, in combination with appropriate general remedies in all stages of both simple and complicated membranous croup.

CHAPTER VII.

TREATMENT OF CROUP CONTINUED.

General Remedies.—Notwithstanding the important consideration which has been given to topical medication in these pages, I would not have its use preclude the employment of appropriate general remedies in the treatment of membranous croup. I shall only remark, however, in this connexion, upon some of the most important of the many remedies which have been advised by different authors in the treatment of this disease.

Emetics.—To fulfil the first intention of cure, in the treatment of croup, which is to arrest inflammatory action, and to prevent the formation and accumulation of albuminous matter in the air-passages, emetics, more than all other general remedies, have been recommended and employed by different writers and practitioners.

"When given during the first stage of croup, they disembarrass the air-passages of the glutinous secretions that clog them, and often produce such a shock to the system as to termi-

nate the disease at once. This shock, and the perspiration that follows it, are among the most important effects of the remedy; for even when no mucous or albuminous matters are expelled from the lungs during the action of the emetic, the patient is generally much relieved after having vomited."[1]

From among the various substances employed to produce emesis in croup, the antimonial preparations are the most frequently selected. They appear to be very generally recommended by writers on this disease, both in England and in France; and American practitioners employ this class of remedies to a great extent, in the treatment of Croup. "The tartarized antimony," says the author above quoted, "is the best medicine of this kind, and it should be given at short intervals, till vomiting is effected; after which it should not be discontinued, otherwise the reaction might prove injurious, but nauseating doses must still be administered."

Now, with regard to the use of this remedy when employed to a certain extent, and with that caution which should always be observed when administering so powerful an agent, emetic-tartar is an invaluable remedy in the

[1] Ryland, p. 153.

treatment of exudative inflammation. But, notwithstanding all this, and the high authority for its use, I have no hesitation in declaring my firm conviction, and this, too, after many years of observation, that the injudicious use of tartarized antimony in the treatment of diseases in young children, has destroyed more lives than it has been instrumental in saving among this class of patients!

With the young subject it not only acts as a direct and powerful sedative, but as a local irritant upon the mucous surfaces. In the observations recorded by Lepelletier on the effects of frequently repeated doses of tartar-emetic upon the human system, it is stated that the pulse was reduced from 120 to 34 beats per minute, and in one from 72 to 44 beats per minute, under the use of continued doses of tartarized antimony.[1]

In a recent number of the New York Journal of Medicine,[2] Prof. John B. Beck, of this city, has published a highly interesting and instructive paper, "On the effects of Emetics in the young subject." In this article he has collected the testimony of many eminent medical men, to show the uncertain, energetic, and dangerous

[1] Medicines, their Uses and Mode of Administration, by J. Moore Nelligan, M. D., etc. p. 157.

[2] Vol. vii. No. 20.

effects of tartarized antimony, when administered in continued doses to young persons.

In one instance recorded by him, "the one thirtieth part of a grain of tartar-emetic given to a child a year old, laboring under croup, produced such severe and protracted vomiting, together with general prostration, as to require stimulants to save life." In another, "small doses of tartar-emetic," were administered to a child about three years old, in a case where no danger was apprehended from the disease. Alarming symptoms of prostration came on, and notwithstanding the use of stimulants, the child died in an hour or two after Dr. Beck saw it.

From these facts, therefore, and others which have fallen under his own observation, and from the recorded opinions of many eminent medical men, Dr. Beck has come to the conclusion, that as a general rule, emetic tartar ought never to be used in children under one year of age; and that in all cases, "the preparations of antimony ought to be resorted to with great caution in very young children, and should never be used except in those cases where a sedative effect is required, and can be borne with safety."[1]

As inflammatory excitement is, ordinarily,

[1] Loc. cit. pp. 158–9.

present in the commencement of croup, and the indication being to arrest this action, an emetic of tartarized antimony, either alone or in combination with ipecacuanha, may, generally, be administered with safety, at this stage of the disease. But, great caution should be observed in continuing the medicine, after the manner which has been recommended by many medical writers. Should a repetition of emetics be required, or medicines to be continued in nauseating doses, other remedies, equally efficacious, after the stage of excitement has passed, and altogether safer, may be employed.

If called during the first stage of croup, I am accustomed to commence the treatment of the disease, by exhibiting an emetic dose of tartarized antimony and ipecacuanha, from half of one grain, to a grain of the former, with ten to fifteen grains of the latter, according to the age of the child, and, after a delay of ten or fifteen minutes, to follow its administration with the topical application of a solution of nitrate of silver to the tonsillary and faucial regions.

This operation has the effect to excite, almost invariably, immediate and free vomiting; and if the emesis and application be repeated in the course of half an hour or an hour, they not un-

frequently arrest the further progress of the exudative inflammation.

When it becomes necessary to repeat the emetic operation, in the course of the progress of the disease, I have found the sulphate of zinc, in combination with ipecacuanha, to be the most certain, efficacious, and safe emetic that can be administered.[1]

Dr. Copland recommends, as the best emetic, on the increase of the disease, tartarized antimony, and the oxymel of colchicum.

"Whilst vascular excitement continues," he remarks, "either this combination, or the antimony only, in repeated doses, as suggested by Cheyne and Michaelis, is the best emetic; but when we wish to detach the membranaceous exudation, the preparations of squills alone, or with ipecacuanha, are preferable."[2]

Blood Letting :—"If the patient is in the first, or inflammatory stage of croup," says Dr. Cheyne, "no experienced physician will omit bleeding; if in the second, or that of suppura-

[1] ℞ Zinci Sulphatis gr. x
Ipecacuanhæ pulv. ℈j.
Aquæ tepidæ. ℥iv.

Misce.—A dessert spoonful may be administered every five minutes, until vomiting occurs.

[2] Dictionary of Prac. Med., Article Croup.

tion, no physician will propose it."[1] M. Bretonneau, a physician of equal eminence and experience, makes the following observations on this subject:—"I am forced to declare, contrary to the received opinion, that bleeding in croup has done harm, and accelerated rather than retarded the spread of the coriaceous inflammation. I did not abandon this measure till after reiterated proofs of its injurious effects."

It is difficult to reconcile these adverse opinions with reference to bleeding—opinions which are not only entertained by the above authors, but likewise by many other distinguished writers and practitioners. Much the larger portion of these, however, advocate bleeding, either general or local, in croup, if resorted to in the first stage of the disease, and in cases of an unequivocally inflammatory type. "In the more inflammatory states," says Dr. Copland,[2] "it should be promptly and fully performed;" but he adds, "little will be gained by resorting to it before inflammatory action is manifested, or after excitement has subsided."

Mr. Ryland, who is an advocate for bloodletting when the febrile excitement is great, the patient strong and plethoric, and the disease in

[1] Cyclop. of Prac. Med., Article Croup.
[2] Loc. citat.

an incipient state, remarks; "in town practice, and especially amongst the pauper class of the community, bleeding, even by leeches, generally does harm, unless in the very earliest stages of the disease; it weakens the patient, and in most instances without putting a stop to the tracheal inflammation."

Dr. Home likewise declares that bleeding employed in the second stage of this disease, or when the membrane is formed, cannot possibly be of advantage.[2]

In my own experience, I have not been favorably impressed with the effects of blood-letting in croup; having met with cases where this measure being employed freely, not only failed to arrest the disease, but evidently proved positively detrimental.

I would not, however, be understood to discard altogether bleeding in croup. Cases there are, where a timely and judicious employment of this remedy will produce the happiest results. When the affection occurs in strong and plethoric children, and is attended with a high degree of vascular excitement, depletion in the access of the disease by either local or general bleeding, is a most efficient means of arresting

[1] Loc. citat. p. 149.

[2] An Inquiry into the Nature of Croup, p. 57.

the exudative inflammation. But if this favorable period, which Dr. Cheyne calls "the golden opportunity," be lost, and the first stage is allowed to pass, blood-letting will only have the effect in the second stage to weaken the patient, and to check that muculent secretion which serves to loosen and detach the adventitious membrane, and render its expectoration more certain. Blood-letting, then, if employed at all, in the treatment of croup, let it be remembered by every practitioner, must be adopted before the adventitious membrane has formed, for its use after this process has taken place, will, as M. Bretonneau has remarked, accelerate rather than retard the coriaceous inflammation.

Mercury.—Dr. Rush, of Philadelphia, was amongst the first to recommend the employment of the mercurial preparations in the treatment of croup. "Our principal dependence," Dr. Rush remarks, "must be placed on calomel; the bark is scarcely a more certain remedy for intermittents, than calomel in the humid cynanche trachealis."[1]

Many other physicians place great dependence on this remedy, exhibited every few hours in croup. Some writers consider it a specific

[1] Medical Inquiries and Observations.—Vol. i. p. 145.

in the disease, if administered in large and frequently repeated doses. Calomel has been given alone, and in combination with the antimonial preparations, with antispasmodics, with James's powder, with the oxide of zinc, and with opium. Of all the mercurial preparations calomel is undoubtedly the best form for internal administration in the treatment of croup. In my own experience, I have had undoubted evidence of its great utility in this disease. In all cases of exudative inflammation, where topical measures and emetics fail in the first stage to arrest the disease, prompt recourse should be had to mercurial remedies. Under such circumstances, I am accustomed to administer calomel in combination with opium and ipecacuanha.[1] The dose should be varied according to the age and condition of the patient. From one to three grains of calomel, with half a grain of ipecacuanha, and from the tenth to the twentieth of a grain of opium, may be given every two or three hours until the disease yields, or the constitution is affected by the remedy. "Directly that the patient becomes influenced by the calomel, lymph ceases to be effused in the trachea; and

℞. Hydrargyri Submur. ℈j.
Ipecacuanhæ pulv. gr. x.
Opii pulv. gr. i.
Misce bene et divide in pulv. x.

though it is doubtful whether the false membrane is ever absorbed again into the system, it soon becomes detached by the secretion from the subjacent mucous follicles, and will be coughed up by degrees." [1]

Hydrocyanic Acid.—The sedative powers of hydrocyanic acid when medicinally employed, its influence in reducing the force and frequency of the pulse, and in allaying the sensibility of the mucous system, serve to render it a valuable remedy in the treatment of some of the forms of croup.

Hydrocyanic acid was first employed as a therapeutic agent by the Italian physicians, near the commencement of the present century. Soon after its introduction into the Materia Medica, it obtained some celebrity as a remedy in disease of the pulmonary organs, and it has since been employed with more or less repute in other morbid conditions of the air-passages. It is the most valuable remedy we possess, for the treatment of hooping-cough. "Cautiously administered," remarks Dr. Granville, "this medicine has seldom failed to remove the disease, and it is singular that children bear the

[1] Ryland, p. 148.

action of this sedative medicine in small doses, better than adults." [1]

In the treatment of the latter stage of croup, particularly when this disease has been complicated with bronchial inflammation, I have found the hydrocyanic acid invaluable in allaying the great restlessness—the spasmodic and harassing cough, symptoms which often attend this complicated form of the affection.

Various other remedies have been advised, and are employed for the treatment of croup; but, for an account of these, I shall refer the reader to the more general treatises on the disease.

Tracheotomy.—On the subject of tracheotomy in croup, I have but little to remark. Several times I have been called on to perform the operation in the latter stage of the disease, but have always refused to do it. So difficult and dangerous have I considered the operation, and so very small the chances of success attending it, that in no case which has fallen under my notice have I deemed the performance of tracheotomy at all justifiable.

Dr. Cheyne, in his work on the Pathology of the Larynx and Bronchia, has established the

[1] Historical and Practical Treatise on the internal use of the Hydrocyanic Acid.

fact, that death in croup does not occur because there is an insufficiency of air admitted into the lungs to effect the arterialization of the blood; for it has been ascertained that in such cases three eighths of the aerial canal are always open,—constituting a space quite sufficient for the transmission of all the air necessary to the maintenance of the process of respiration.

How, then, can we expect the fatal result in croup to be prevented by the artificial admission of any quantity of air into the pulmonary cells?

"With regard to the general results of tracheotomy," observes Mr. Ryland, "when performed for the cure of croup, I have no hesitation in saying, that they are so unfavorable as to warrant us in the strongest condemnation of it, under almost every conceivable circumstance."[1]

After employing the means now at our command, both topical and general, for the treatment of the disease, there does not remain, I believe, a chance of success from the operation: and we are not justified in having recourse to it until these measures have been exhausted.

[1] Op. citat. p. 159.

